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The Home User's Guide to Commodore Computing

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RUN

November 1985 A CWC/I Publication

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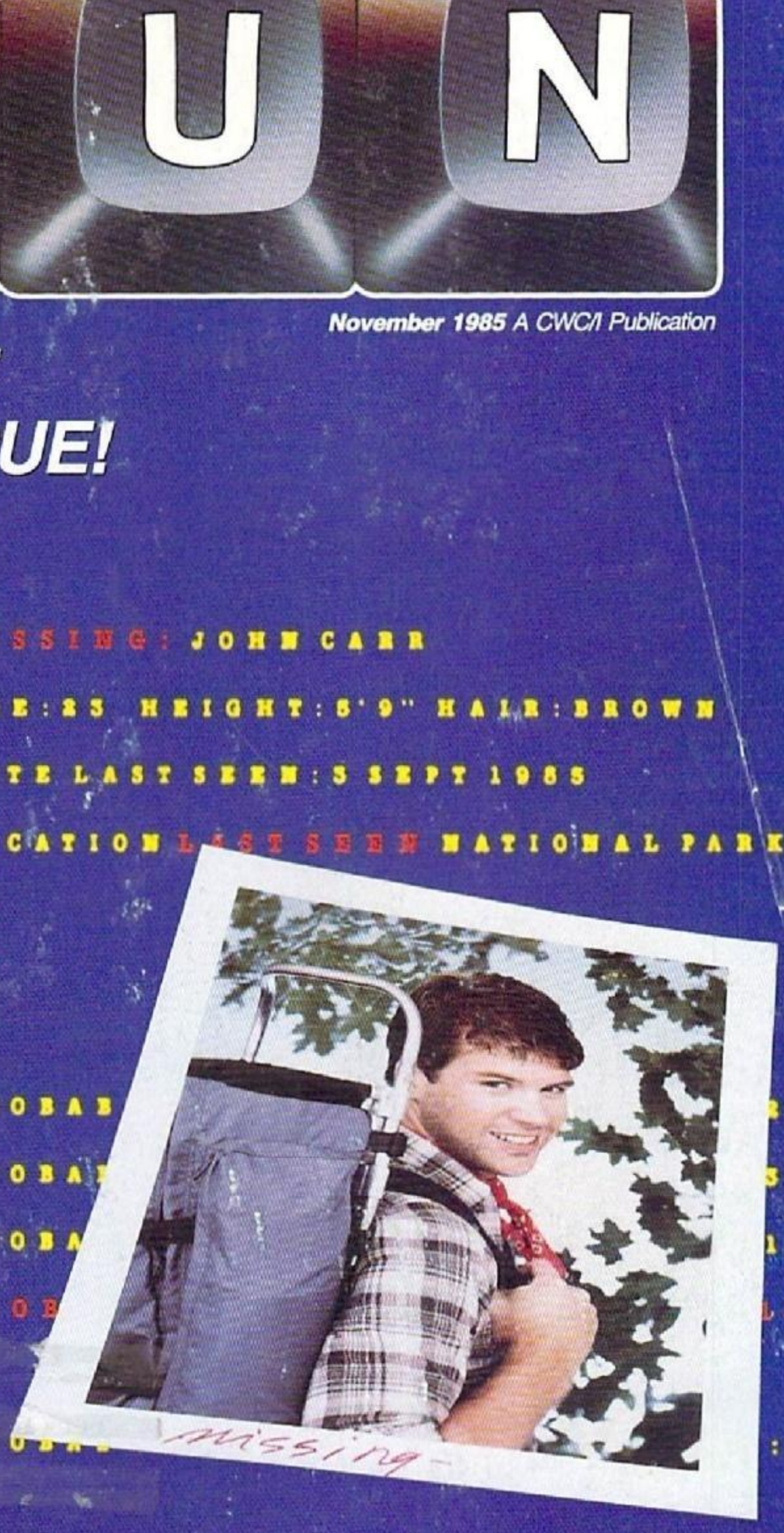
COMMODORE TAKES A QUANTUM LEAP

Program of the Month—PRINT SCREEN PLUS

SPRITE CONTROL ON THE C-128

C-64 SOFTWARE FOR MODEM USERS



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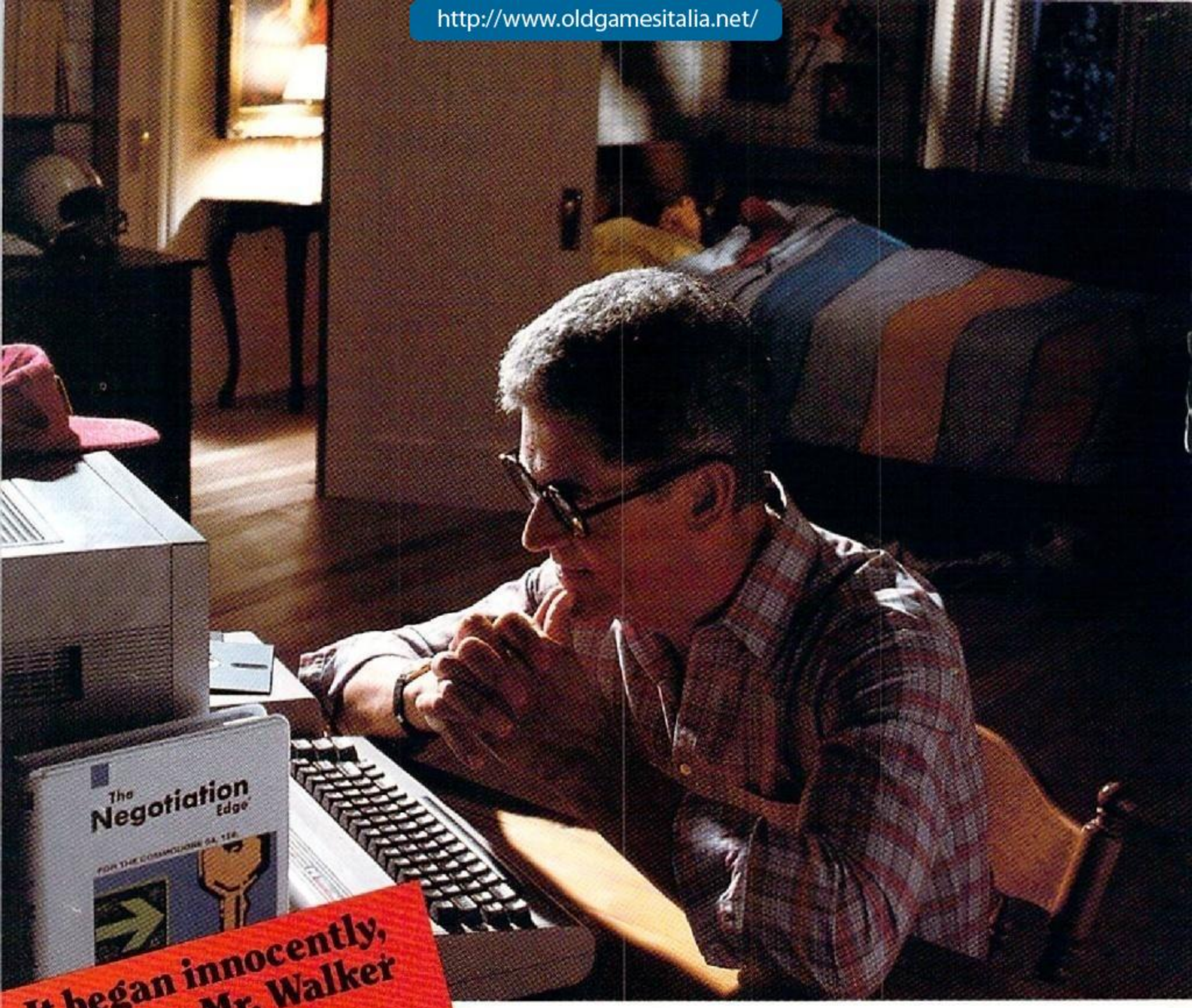

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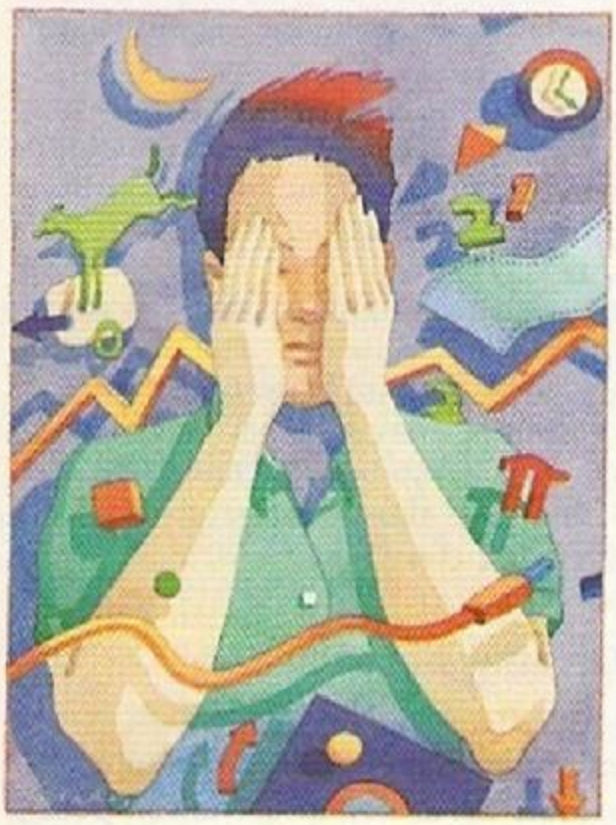

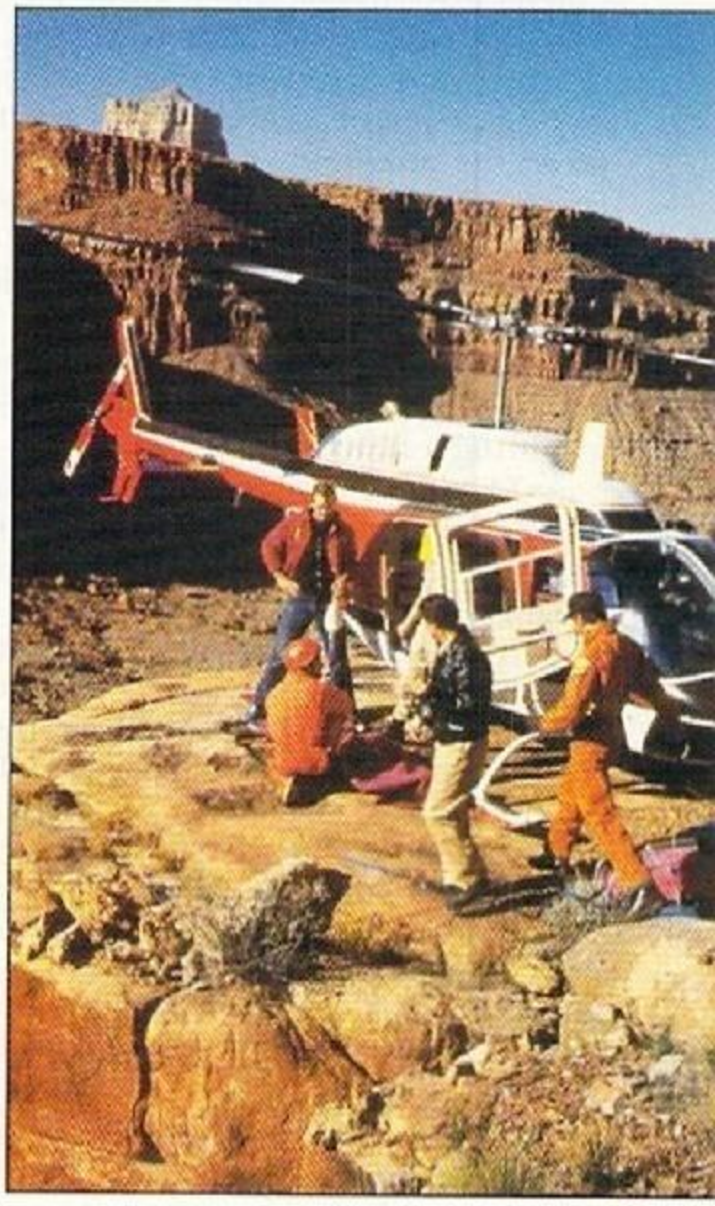

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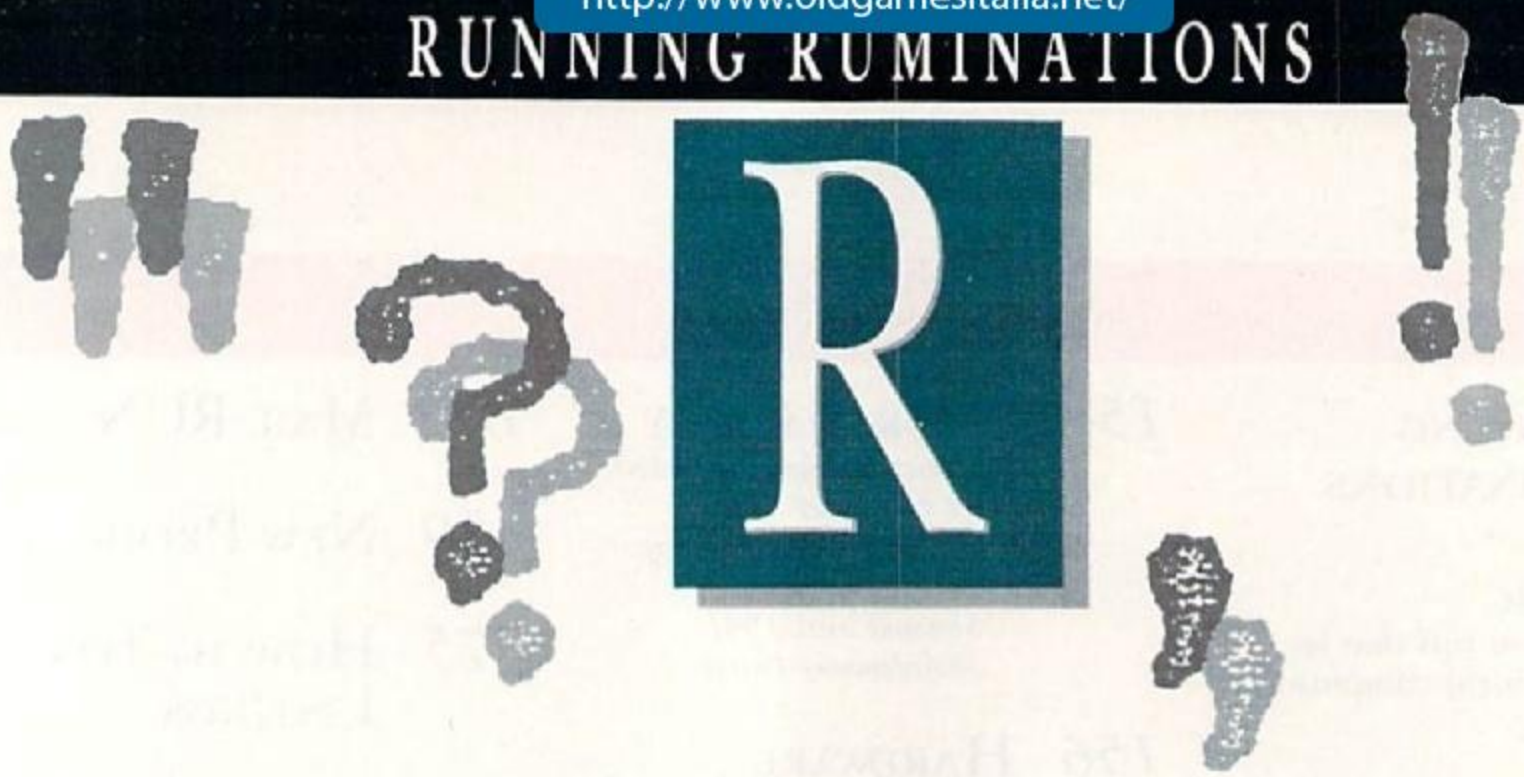

November Highlights

In the lead article for this November issue, we feature a "life-or-death" application of the Commodore 64. Search-and-rescue experts in the rugged southwestern U.S. are relying on the 64 and a remarkable program called CASIE to help them locate lost or missing persons. The program's 90 percent success rate in finding stranded campers, lost hikers or other victims justifies its use in large-scale rescue missions. This application has also captured the attention of both the U.S. Navy and the Air Force, who are considering the system for their search missions.

The exciting world of the C-64 continues in this issue with a useful program called Print Screen Plus, which will print out your graphics screen displays—whether you're in low- or high-resolution mode. And it's as easy as hitting a function key.

As Commodore's new 128 computer is being released to retail outlets (disk drives and monitors are not far behind, Commodore tells us), *RUN* is beefing up its coverage of that system. In this issue, we'll explore the sprite graphics capability of the C-128, and readers will also find out what versions of CP/M will run on the C-128 and how to load and run CP/M programs.

This year has been a busy one for Commodore-related manufacturers. Over 125 new products for Commodore users have been released in 1985. November readers will be able to determine what new peripherals and accessories are available for the Commodore systems by turning to *RUN*'s second annual hardware buyer's guide (p. 102). Products for the C-64 and C-128 are listed and categorized, along with a brief description, the price and the name and address of the manufacturer.

Telecommunications enthusiasts will be anxious to read about Commodore's new electronic network, Quantum-Link, which is reviewed in this issue. Also, Jim Grubbs, author of a recently published book entitled *The Commodore Ham's Companion*, takes a hard look at some of the major commercially available communications software for modem users.

RUN continues its support of the popular Datafile database series with a useful companion utility program that's sure to please. The DFRestructure program lets you easily and "safely" change existing files created by Datafile and save the new file.

Micro-Novel Contest

RUN recently notified the five winners of its Great RUNaway contest, in which each winner received hardware and software totalling over $6000. Next month we will publish the names of the winners and share their reactions with you.

If you were unsuccessful in the Great RUNaway, here's another opportunity for you to be a winner.

Called the "Great American Writing Contest," this contest is actually open to school-age children, who will compete in various age levels to create the best "micro novel" using Woodbury Software's PlayWriter Series.

Through their participation in this contest, youngsters will not only develop skills in reading, writing and editing, but will also experience a great deal of satisfaction in producing their own books. Entries will be judged according to content, originality, grammar, spelling and overall effect.

Woodbury Software and Grolier Electronic Publishing, co-sponsors of this contest, have announced that entry blanks will be distributed through the schools and at selected retailers. An entry form is also available in this issue of *RUN* (see p. 165).

RUN is excited about its role—albeit a limited one—in promoting this educational endeavor. For many children and parents, this contest could represent their first introduction to the Commodore computer as a real educational tool. *RUN* is pleased to be associated with this enterprise, and we commend those companies that are also supporting this writing contest.

Good luck to all the entrants! **db**

Jump on Our RUNning Board

RUN invites you to contact its bulletin board (RUNning Board), which provides up-to-date information about *RUN* and the Commodore industry, as well as useful computing hints and tips. You can get on-line any time, 24 hours a day, seven days a week, by dialing 603-924-7632. We use a standard protocol, 300 baud, one stop bit, no parity, full duplex and a word length of eight bits.

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"The only other comparable product would be Lotus 1-2-3 for the IBM PC; nothing in the C64 world comes even close to the features of Vizastar."

AHOY July 85

"I found Vizastar would do anything Lotus 1-2-3 could, and then some. It's my Commodore choice to become the standard against which the others will be judged."

INFO 64 Magazine, Issue #7

"Vizastar is an exceptional package that rivals the features of programs such as Lotus 1-2-3 and offers C64 owners the kind of integrated software previously only available for higher-priced systems."

RUN Magazine, June 1985

"I scrutinized, tested and experimented with Vizastar extensively, but could find no weaknesses whatsoever. It is the most comprehensive, most flexible, most powerful and easiest to use integrated software package I've worked with."

Commodore Microcomputer, Sept/Oct 1985

"I use an IBM PC at work with Lotus 123. I feel Vizastar is just as good and in someways better than 1-2-3."

Steven Roberson, NC. End User

"I have used Multiplan and Superbase; both are good pieces of software, but are inadequate when compared to Vizastar."

Jim Mathews, WA. End User

"So good, I bought a second C64 and Vizastar for my office. A wild bargain! You've saved me from having to buy IBM and Lotus."

Philip Ressler, MA. End User

VIZAWRITE CLASSIC for C128

This is the new word processor from Vizastar's author, Kevin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

Three different proportionally-spaced "near letter quality" fonts are also built-in for use with Commodore or Epson compatible printers. You can merge almost any other word processor file directly into Vizawrite, including Paper Clip and Omniwriter. Naturally, it is also compatible with Vizastar. At all times, what you see on the screen is exactly the way it will be printed out. Vizawrite can do mail-merges and has an integrated 30,000 word spelling checker that you can expand yourself.

PROGRAM SPECIFICATIONS

Both Vizawrite and Vizastar are written in 100% machine language and run in the 128's FAST mode, making it lightning fast. They require a C128 with 80 column color or monochrome monitor. Both come with a cartridge, a diskette, a backup, and a reference manual. Vizastar also includes a 50 page tutorial book. Both work with 1541 or 1571 disk drives.

RISK-FREE OFFER

Vizastar 128 is priced at $119.97. Vizawrite's price is $79.97, but as an introductory offer, it is now only $69.97. Vizastar 64 XL8 is now available for $119.97. We are so positive you will be satisfied with our programs that we offer a 15-day money-back guarantee. Try it Risk-Free. Call us today or send a check or money order. VISA/MC accepted.

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MAGIC

Compiled by LOUIS F. SANDER

MAGIC is tricks, MAGIC is fun.
MAGIC is doing what cannot be done.

Every month, Magic brings you brief and useful computer tricks from around the world—tricks to make computing easier, more enjoyable or more exciting. We number our tricks in hex, the counting system of sorcerers and computerists.

Magic solicits your simple hardware ideas, short programs, useful programming techniques, little-known computer facts and similar items of interest. We look for new or recycled material that can be implemented with a minimum of time, effort or theoretical knowledge and that is of current value to Commodore computerists (Plus/4 and C-16 owners, too). RUN will pay up to $50 for each trick accepted. Send your tricks to:

MAGIC
c/o Louis F. Sander
PO Box 101011
Pittsburgh, PA 15237

If you enclose a self-addressed stamped envelope, we'll send you a Trick Writer's Guide. Readers outside the United States may omit the stamp.

In Magic's early days, we received and printed lots of one-liners—VIC and C-64 programs that could be written using a single line number. After a year or so, our readers exhausted the possibilities of the genre, and the flow of original ideas dried up. Well, a new day has dawned, and its name is Commodore 128! Not only are there new capabilities to show off in a one-liner, but also a single line number can be used on a 160-character line. So, once again, we're looking for one-line programs, and we expect to receive some great ones. The first of the new breed appears below.

$264 Sprite shower—This one-liner for the Commodore 128 gives a dazzling and animated depiction of sprites and how they move. Not only is it fun to watch, but it's also a useful tutorial on C-128 sprites and how they're controlled.

```
10 FOR J=3584 TO 4095 : POKE J,204 : NEXT : FOR K=1 TO 8 :
   SPRITE K,1,K : MOVSPR K,50*K#K : NEXT
```

Mary Lee McCafferty
Butler, PA

$265 That which flies—Since this issue of *RUN* actually arrives before November first, the accompanying program will provide some timely entertainment, as well as some insight into sprite handling on the C-64. The Data statements contain a sprite, which the rest of the program Pokes into memory and animates.

```
1Ø REM THAT WHICH FLIES - SAMUEL SEWALL
2Ø POKE53281,6:PRINT"{SHFT CLR}{COMD 7}{4 C
   RSR DNs}"
3Ø FORS=832TO894:READT:POKES,T:NEXT
4Ø V=53248:POKE2Ø4Ø,13:REM SPRITE AREA
5Ø POKEV+21,1:REM DISPLAY SPRITE
6Ø POKEV+39,1:REM COLOR IT WHITE
7Ø POKEV+1,6Ø:REM Y POSITION
8Ø FORJ=1TO255:POKEV,J:NEXTJ:REM X POS
9Ø LIST
91 DATA ØØØ,ØØØ,ØØØ,ØØØ,Ø64,ØØØ,ØØØ,Ø64
92 DATA ØØØ,ØØØ,Ø96,ØØØ,ØØØ,Ø96,ØØØ,ØØ3
93 DATA 252,ØØØ,ØØØ,24Ø,ØØØ,ØØØ,Ø96,ØØ1
94 DATA 255,225,2Ø4,Ø63,255,112,124,24Ø
95 DATA 192,248,251,ØØØ,112,252,ØØØ,225
96 DATA 248,ØØØ,ØØ1,252,ØØØ,ØØ3,1Ø2,ØØØ
97 DATA Ø28,Ø99,ØØØ,12Ø,Ø97,192,248,Ø96
98 DATA ØØØ,176,112,ØØØ,Ø32,ØØØ,ØØØ,ØØØ
```

Samuel Sewall
Salem, MA

$266 That which flies not—When you tire of the preceding trick, just change sprites by adding the following lines to the program. They will replace some lines you previously typed, so you'll really have two programs, each with its own title and Data statements and each with identical lines 20–90. Give thanks for the typing we've saved you.

Try sending your own best sprite to Magic. Put it in our standard form: as Data statements numbered 91–98, with leading zeroes to make each entry three characters long. Include a description of your sprite, but don't include Poking or animation routines.

```
1Ø REM THAT WHICH FLIES NOT - L. SANDER
91 DATA ØØØ,ØØØ,ØØØ,Ø05,ØØØ,ØØØ,Ø42,16Ø
92 DATA ØØØ,Ø85,Ø8Ø,ØØØ,Ø42,168,ØØØ,Ø85
93 DATA Ø8Ø,ØØØ,17Ø,168,ØØØ,Ø85,24Ø,ØØØ
94 DATA 175,252,Ø14,Ø95,255,223,Ø47,255
95 DATA 253,Ø95,255,249,Ø39,255,248,ØØ3
```


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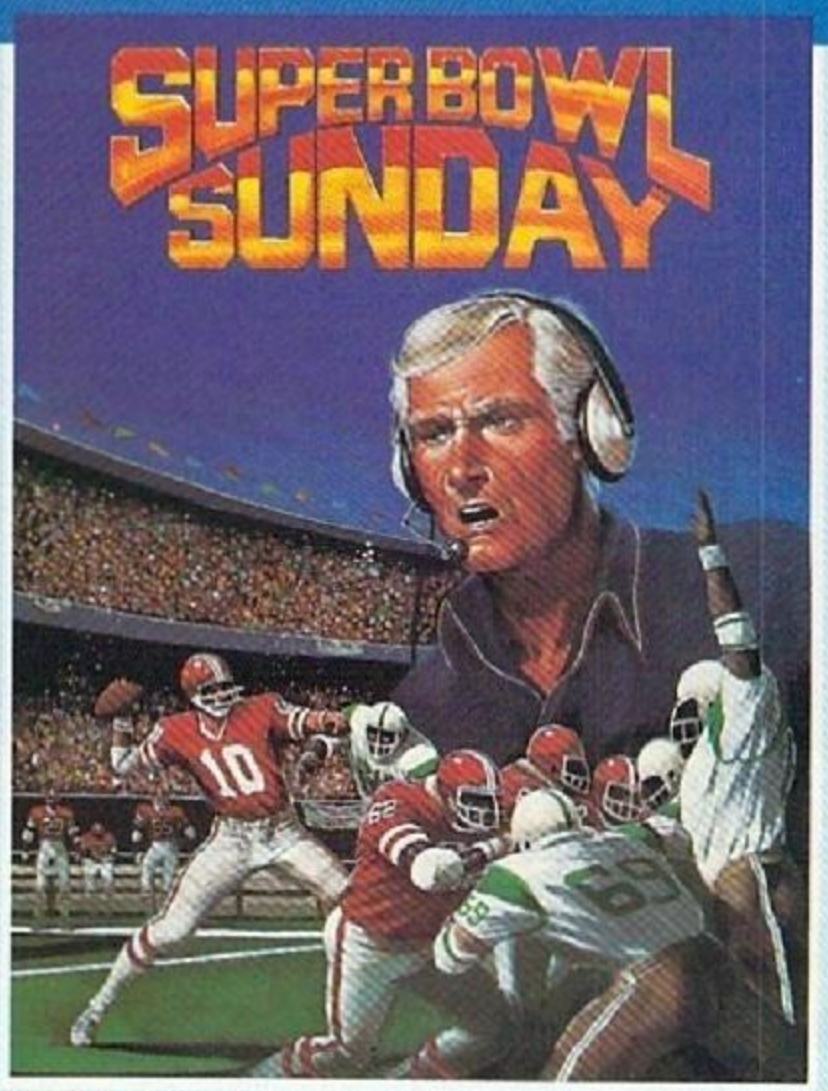
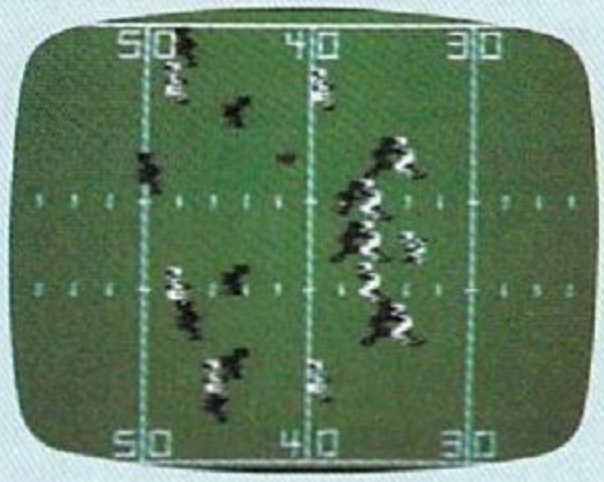
Super Bowl Sunday is really 3 games in one; you can play head-to-head against another live opponent in the 2-player version . . . or play solitaire against the computer programmed to react to your strategy . . . or set the computer on autoplay and watch the computer play against itself.

Regardless of which version, you will be amazed at the graphics. This is the only statistically authentic game to give you all 22 players on the screen at once going through the actual play in animated action.





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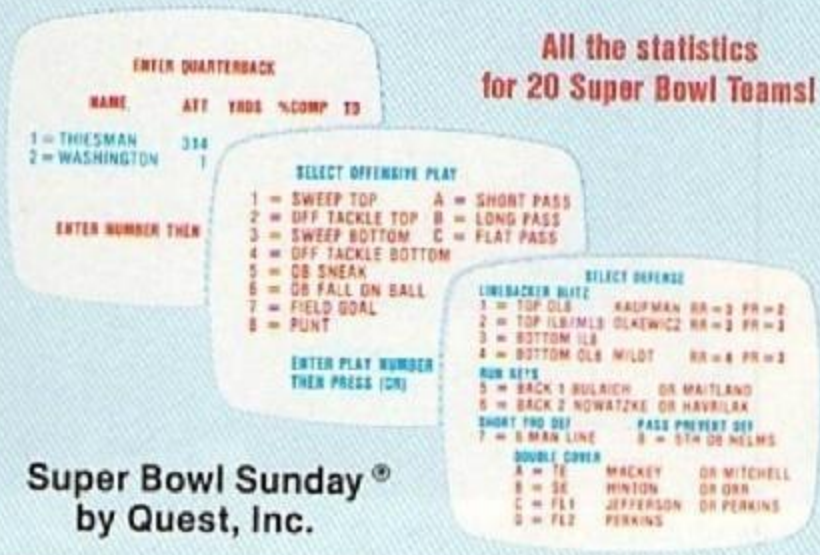
- ★ More than a dozen **offensive and defensive plays** to choose, giving YOU control over which players do what.
- ★ Individual players' performances and statistics are updated throughout the game. You can view them during and after the game on your screen or keep permanent records using the printer option.
- ★ Your brilliant play re-enacted by **all 22 players** on the screen.
- ★ **Three modes of play:** head-to-head, solitaire and autoplay.


ENTER QUARTERBACK
NAME ATT YRDS %COMP TD
1 = THIESMAN 334
2 = WASHINGTON 1
ENTER NUMBER THEN
SELECT OFFENSIVE PLAY
1 = SWEEP TOP
2 = OFF TACKLE TOP
3 = SWEEP BOTTOM
4 = OFF TACKLE BOTTOM
5 = QB SNEAK
6 = QB FALL ON BALL
7 = FIELD GOAL
8 = PUNT
A = SHORT PASS
B = LONG PASS
C = FLAT PASS
ENTER PLAY NUMBER THEN PRESS (CR)
SELECT DEFENSE
LINEBACKER BLITZ
1 = TOP OLB KAUFMAN RR = 3 PR = 3
2 = TOP ILB/MLB OLKEWICZ RR = 3 PR = 3
3 = BOTTOM ILB
4 = BOTTOM OLB WILDT RR = 4 PR = 3
RUN KEYS
5 = BACK 1 BULAICH OR MAITLAND
6 = BACK 2 NOWATZKE OR HAVRILAK
SHORT PRO DEF
7 = 5 MAN LINE
PASS PREVENT DEF
8 = 5TH QB HELMS
DOUBLE COVER
A = TE MACKEY OR MITCHELL
B = SE WINTON OR ORR
C = FL1 JEFFERSON OR PERKINS
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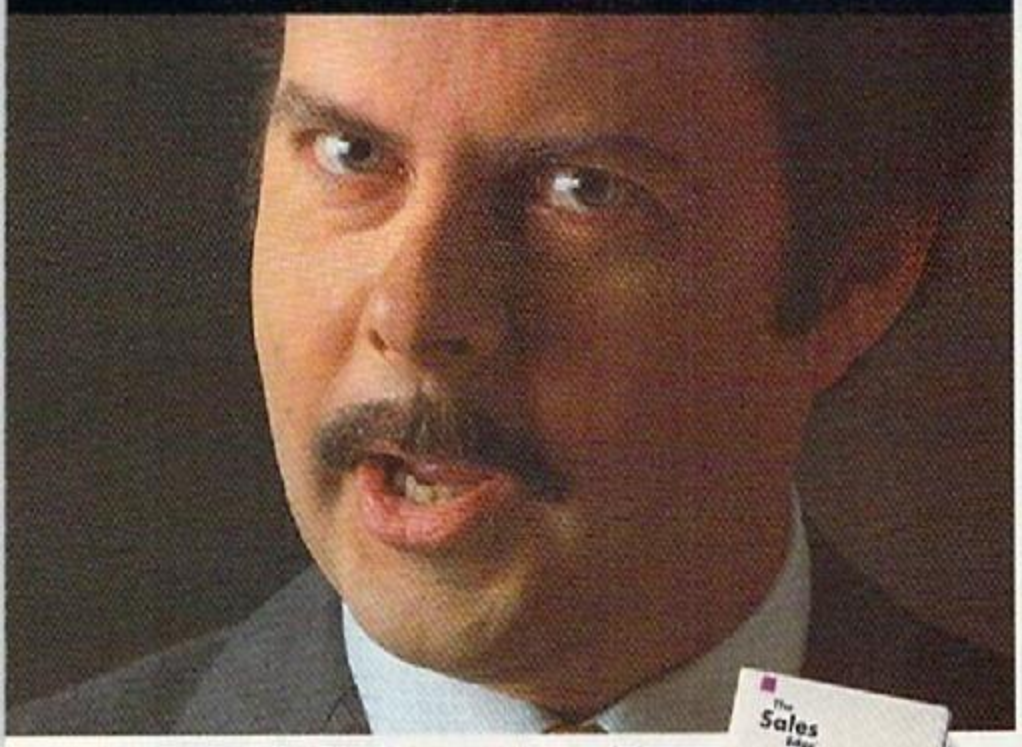

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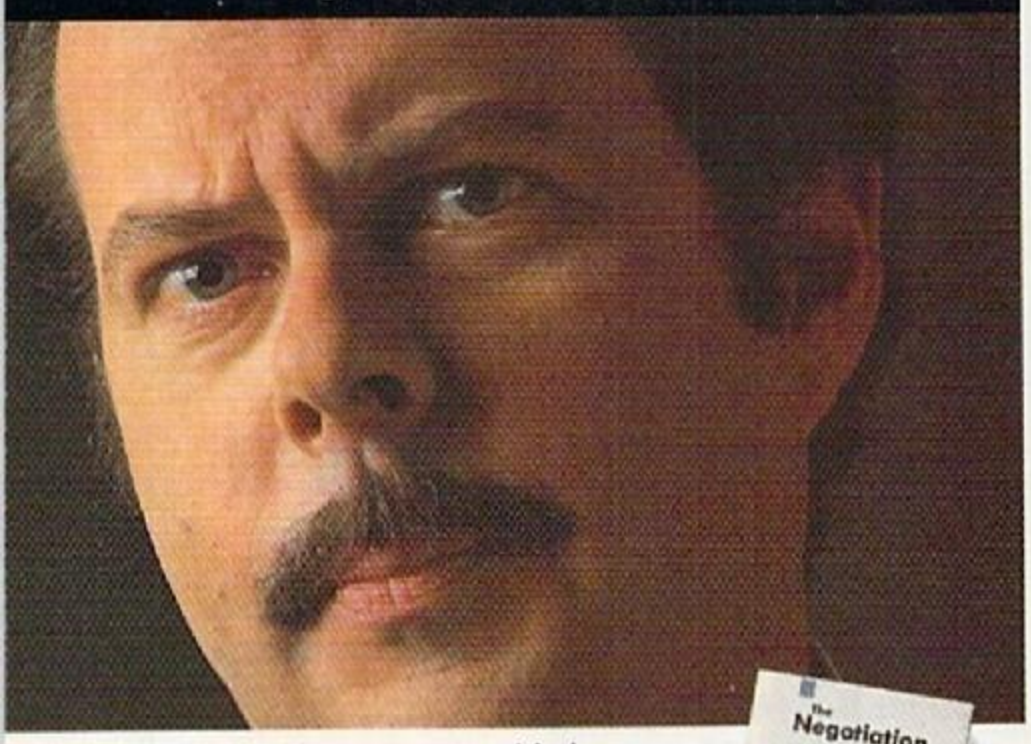

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Magic

```
96 DATA 255,248,ØØ1,255,224,ØØ3,127,128
97 DATA ØØ1,13Ø,ØØØ,ØØØ,227,192,ØØØ,ØØØ
98 DATA ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
```

L.F.S.

$267 Typing Data statements—When typing a series of Data numbers, I place my fingers over the number keys, using them as the home row. Instead of inserting commas between the numbers, I use my thumb to enter spaces. Then, after entering the line, I go back to the beginning, this time proofreading my work and using the comma and cursor-right keys to put the commas where they belong.

I have found that I can enter data much faster this way, because of the modified touch system of typing and the accuracy that comes from the overall process.

K.W. McFall
Connersville, IN

$268 Deek—Commodore machines store addresses in a low-byte, high-byte format, which means that to convert the address to decimal form, you must enter a statement similar to

```
20 SV = PEEK(45) + 256 * PEEK(46)
```

to get the value of the low byte plus the high byte multiplied by 256.

If your program does many such conversions, it may be convenient to set up a user-defined function to do them. Often the function is named DEEK (a mnemonic for Double pEEK). Here it is:

```
10 DEF FN DEEK(A) = PEEK(A) + 256 * PEEK(A + 1)
```

When you want to find a two-byte address whose low byte is at NN, you enter

```
20 SV = FN DEEK (NN)
```

Notice that the dummy variable name used in the DEF FN statement need not be used when you call the function itself.

William Keith Prusaczyk
Athens, GA

$269 Improving on INT—The Basic function INT(X) is very useful, but sometimes you want the integer closest to X. (INT works by a kind of truncation, not by rounding off.) The simplest way to get the rounded value is by the formula INT(X + 0.5).

This works for both positive and negative numbers, but a problem still remains, since

INT(+ 3.5 + 0.5) = 4 and INT(− 3.5 + 0.5) = − 3

You can cure this by defining and using a function such as

```
DEF FNI(X) = SGN(X)*INT(SGN(X)*X + 0.5)
```

Jerry Bridgman
Madison, WI

$26A Quote mode tip—When a quotation mark is printed to the screen, the value of memory lo-

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cation 212 (C-64 and VIC) is changed from its normal 0, and the computer goes into Quote mode. In Quote mode, of course, cursor controls and other control characters print as reverse-field graphics symbols. If you print the quote mark from within a program, but want to avoid going into Quote mode, just enter POKE 212,0.

Joseph R. Charnetski
Dallas, PA

$26B Memory Scope—The accompanying program will display one page of memory at the top of your computer's screen. Unlike a machine language monitor, the Memory Scope display changes along with the contents of memory, letting you see what happens as keys are pressed or Basic statements are executed.

The main listing below is a Memory Scope for the C-64. The others are the changes that must be made to accommodate the indicated machines. If you use one of these machines, you should type in the C-64 version, then add the changed lines as shown.

A memory page is a 256-byte block of memory, and pages start at integral multiples of 256. The pages with low numbers and those with high numbers are the most interesting to explore; there are no pages numbered greater than 255. To find the page number of any address, divide it by 256 and drop everything after the decimal point.

In the display, the characters have their screen Poke values: @ = 0, A = 1, B = 2 and so on. A complete listing appears under Screen Display Codes in the back of your user's manual. If your cursor disappears while using Memory Scope, it's probably hiding behind the display. Cursoring down will bring it back into view.

Memory Scope is a simple but powerful tool for understanding your computer's operation.

```
1 REM MEMORY SCOPE - LOUIS F. SANDER
2 REM C-64 VERSION
3 DATA 12Ø,169,145,141,Ø2Ø,ØØ3,169,ØØ3
4 DATA 141,Ø21,ØØ3,Ø88,Ø96,173,136,ØØ2
5 DATA 141,158,ØØ3,162,ØØØ,189,ØØØ,ØØØ
6 DATA 157,ØØØ,ØØ4,2Ø2,2Ø8,247,162,ØØØ
7 DATA 173,134,ØØ2,157,ØØØ,216,2Ø2,2Ø8
8 DATA 25Ø,Ø76,Ø49,234,4764
1Ø FORJ=1TO44:READK:CS=CS+K:NEXT:READCK
2Ø RESTORE:IFCS<>CKTHENPRINT"BAD!":STOP
3Ø FORJ=9ØØTO943:READK:POKEJ,K:NEXT
4Ø V$="{SHFT CLR}{6 CRSR DNs}":W$="{CRSR DN
   }":X$="RESTORE"
5Ø PRINTV$TAB(18)"POKE923,N - SYS9ØØ"W$
6Ø PRINT"POKE923,N TO SEE MEMORY PAGE N
7Ø PRINT"{CRSR DN}TO KILL THE DISPLAY, PRES
   S
8Ø PRINTX$" WHILE PRESSING {CTRL 9}STOP{CTR
   L Ø}
9Ø PRINT
1ØØ PRINT"TO REACTIVATE, DO A SYS9ØØ
11Ø SYS9ØØ:PRINT:PRINT


2 REM PLUS/4 & C-16 CHANGES
4 DATA 141,Ø21,ØØ3,Ø88,Ø96,173,Ø62,ØØ5
7 DATA 173,Ø59,ØØ5,157,ØØØ,ØØ8,2Ø2,2Ø8
8 DATA 25Ø,Ø76,Ø14,2Ø6,435Ø
```

Continued on p. 140.

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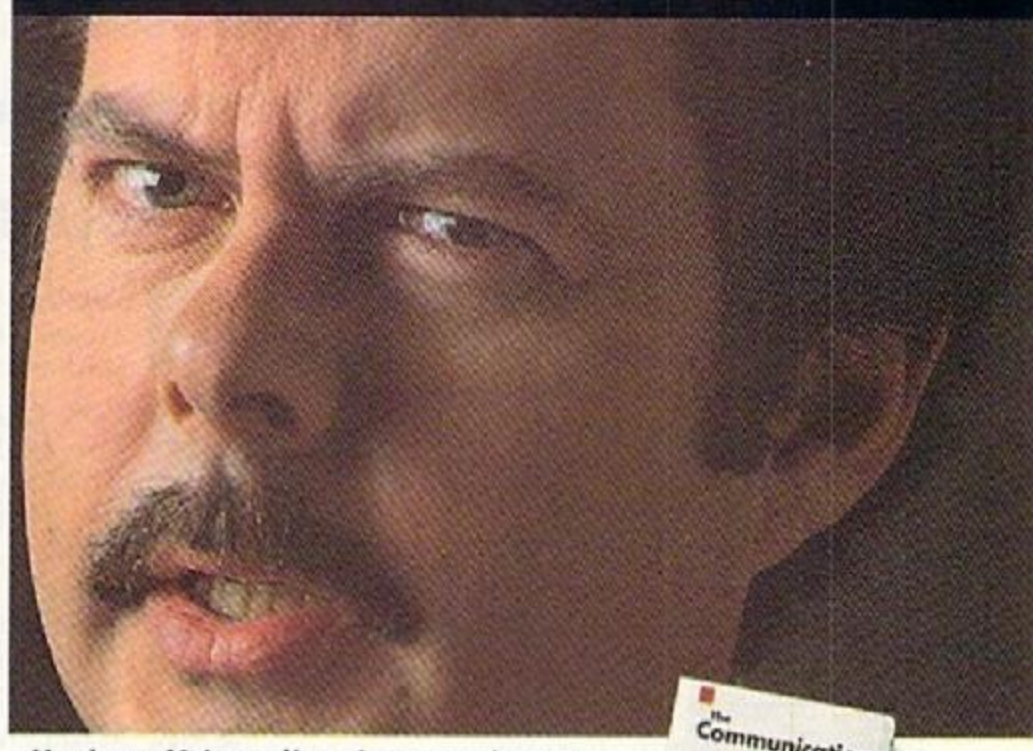

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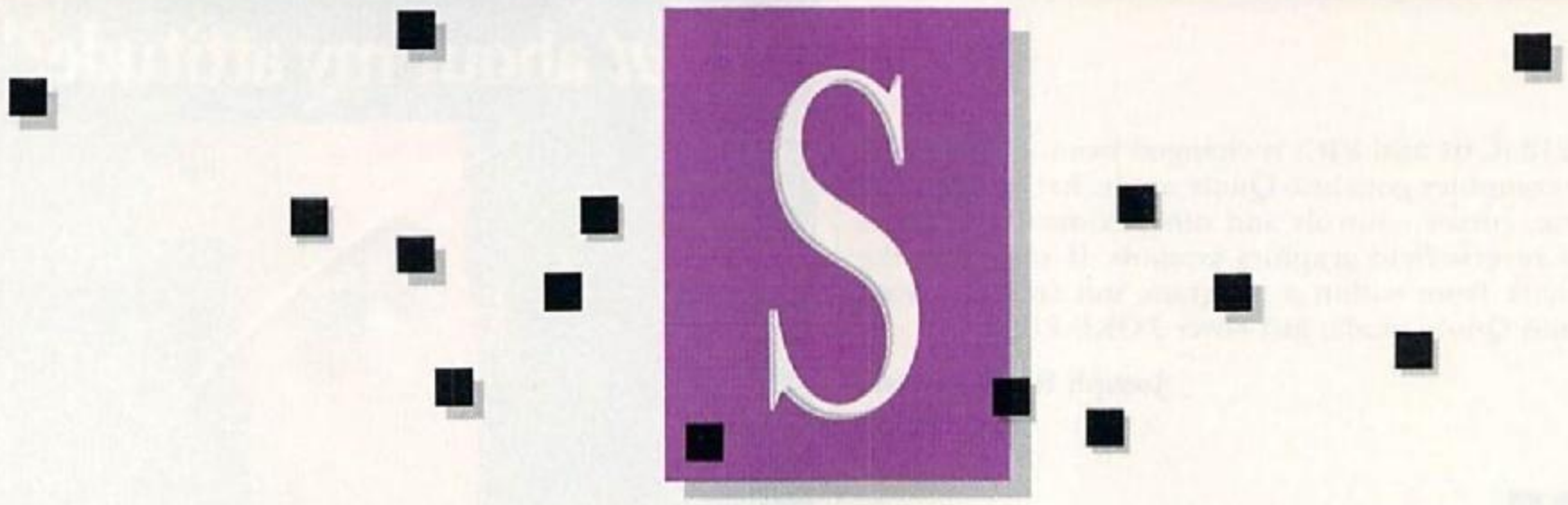

Compiled by SUSAN TANONA

Telemessage

You Can Have this Program Custom-Designed To Fit Your Own Needs

When *RUN* decided to go online earlier this year, finding the right software for our bulletin board was one of our biggest concerns. We were looking for a highly flexible system that was also simple to set up and operate. We wanted a BBS that was friendly to our callers and wasn't too complicated to use. At the same time, we were looking for a system that could be expanded to accommodate more complex features as our needs grew.

The software that we finally decided upon was a version of Tailored Solutions' Telemessage package. Tailored Solutions does indeed live up to its name, as the company will customize the software to fit your own individual needs. (Charges range from $25–$40 for a minor change, to $150–$200 for a major overhaul.) This is a review of the BBS that Tailored Solutions provided us with, which is just one version of the commercially available package.

The flexibility and simplicity of this software was the main reason that we chose it for the RUNning Board. The option to lock out certain features was a real advantage, because it allowed us to start out with a simple system; yet we have the option to expand as our needs increase.

Along with providing callers with information about *RUN* and the computer industry, an important function of the RUNning Board is to help us obtain feedback about the magazine. Thus, the board is set up so that we can ask callers a set of questions; responses are saved to disk and later printed out in report format. The software allowed us to create question-and-answer files with a choice of three response formats: yes/no, multiple choice and open-ended. The program is compatible with Easy Script, the word processor we use to create and edit our files. (We update files weekly.)

This bulletin board system offers several other important features. You can at any time obtain mini-reports (without having to shut down the system) that give such general information as number of callers, start-up/shut-down times and dates. You can have a display on the screen as each caller uses the board, or you can deactivate the screen display completely. You have the option to password-protect your system and set start/stop times and dates in advance.

We have, however, noted a couple of problems with the software. The most serious quirk is that if the system crashes—for whatever reason—the files on the caller response disk are erased. This is due to the fact that the files are not closed until we manually shut down the system.

Also, with the original report-generator program that we received, we encountered some difficulty in printing out caller responses. The program would crash if it encountered a caller-input error. Tailored Solutions was a great help to us in working out this problem, and provided us with an updated report-generator program that included a printer-restart feature.

If you are looking for a serious telecommunications message system, perhaps for your business or user group, Telemessage should rank high on your list of possibilities. Whether or not you need a custom-designed system, Telemessage's many features, as well as its reasonable price, make it a package with a lot to offer. *(Tailored Solutions, PO Box 183, Washington, DC 20044. C-64/$79.50 disk.)*

Guy Wright
***AmigaWorld* staff**

Report Card

A ***Superb!***
An exceptional program that outshines all others.

B ***Very Good.***
One of the better programs available in its category. A worthy addition to your software library.

C ***Good.***
Lives up to its billing. No hassles, headaches or disappointments here.

D ***Mediocre.***
There are some problems with this program. There are better on the market.

E ***Poor.***
Substandard, with many problems. Should be deepsixed!

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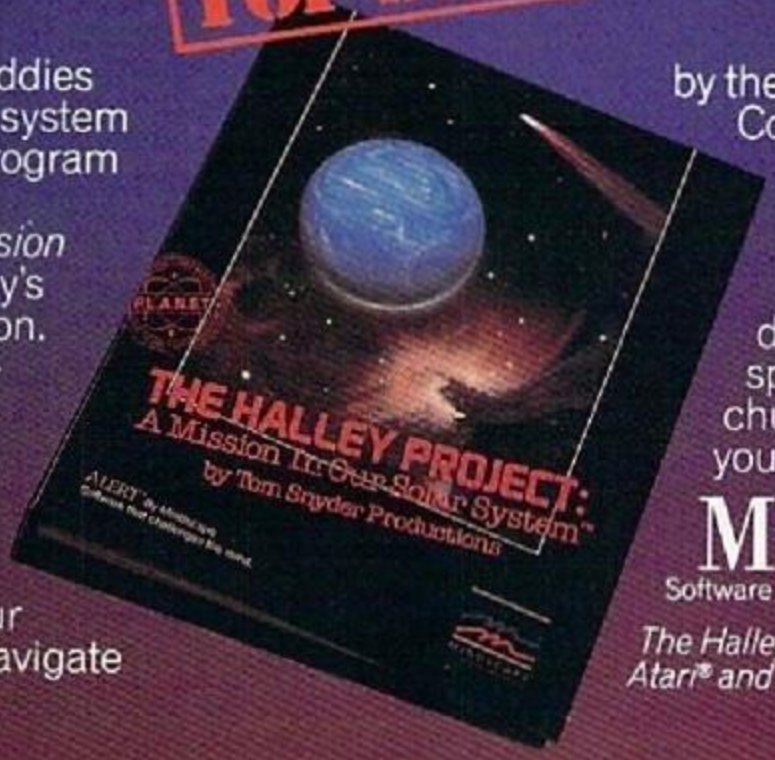
Just tell your friends you're going on a very long trip.

TOP SECRET



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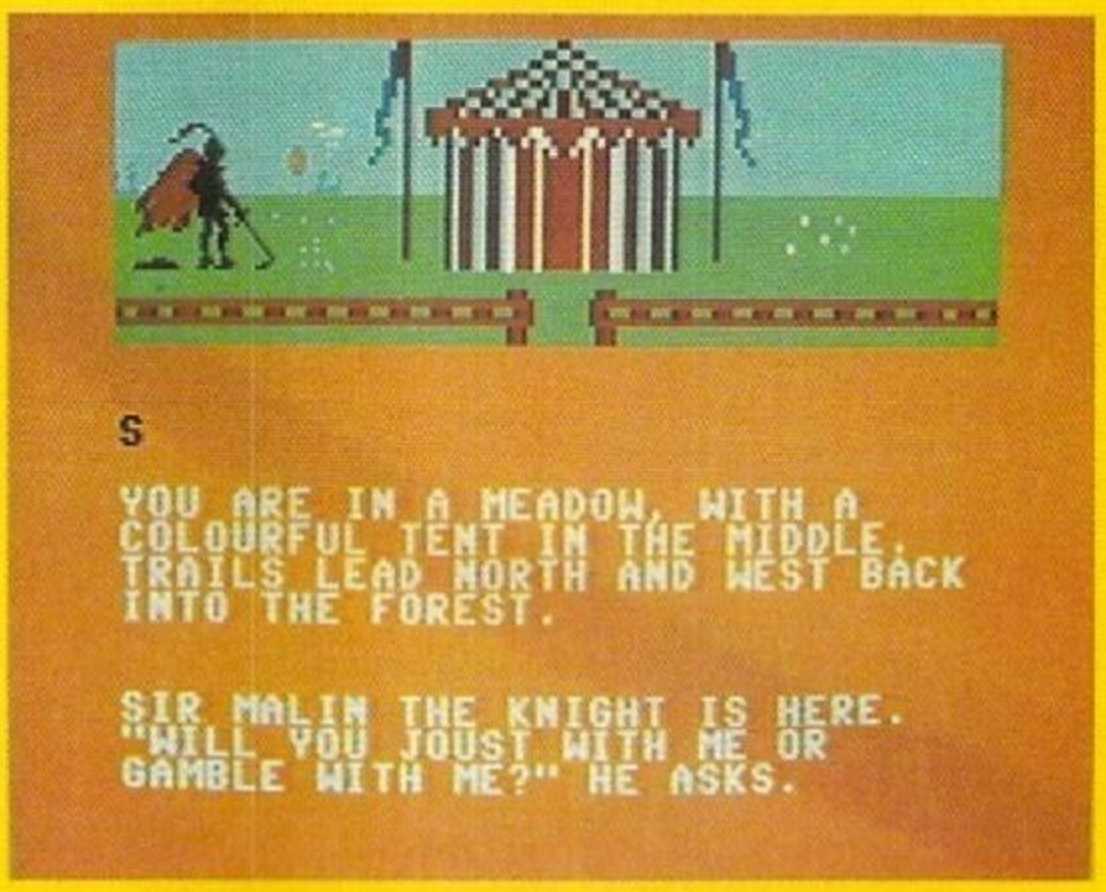
Better Working Spreadsheet

B

A Productivity Package That Will Have You Working Better in No Time


S
YOU ARE IN A MEADOW, WITH A COLOURFUL TENT IN THE MIDDLE. TRAILS LEAD NORTH AND WEST BACK INTO THE FOREST.
SIR MALIN THE KNIGHT IS HERE. "WILL YOU JOUST WITH ME OR GAMBLE WITH ME?" HE ASKS.

The Better Working Spreadsheet is a full-featured electronic spreadsheet with simple word processing features and the search-and-sort capabilities of a database. Superb documentation, five help screens and a handy reference card combine to make this spreadsheet a program you'll have up and working fast.

This program's greatest strength is its documentation, which is thorough and extremely readable. Features, commands and functions are presented very clearly and are supported by examples. Considerable time was put into the creation of this manual, and it shows.

The Better Working Spreadsheet offers a 250-row by 100-column format, into which you may enter numbers, text or formulas. Any changes made at one location will cause all other figures in the worksheet to be adjusted accordingly.

The program's word processing capability allows you to include additional text in your spreadsheet, but it is a limited capability—this is not a fully integrated package.

You move from cell to cell in either of two ways. You can use the cursor keys or, when working on a larger project, you may make use of the Goto option by typing ">" and the coordinates of the destination cell.

All of the commands are entered with a few simple keystrokes. You can save all or part of a given spreadsheet to disk or tape and combine any number of different spreadsheets. This program will also load any text file created by another program.

All the standard spreadsheet commands are available, such as copying and moving cell entries, inserting or deleting rows and columns, formatting cell entries and adjusting column width (1–38 characters).

But this program also offers other features, such as a command that allows you to title rows and columns so that these headings remain in place as the rest of the visible data scrolls beneath (called windowing). You can also sort any column of data alphabetically or numerically, and search for a specific entry.

You'll find more than 30 mathematical functions—from simple addition to logarithms, absolute values, a random number generator, powers, roots and trigonometric functions.

Especially useful is the If function (If. . . Then), which you enter as a formula. Capable of incorporating the logical operators (less than, greater than, and so on), this powerful feature allows you to say, "If this condition exists, do X; otherwise, do Y."

This spreadsheet offers some very advanced math functions, such as net present value and programmable iteration, which lets you do forecasting (calculating unlimited values until a given condition is met).

Of course, the ultimate beauty of a spreadsheet program is the option to print out a hard copy of your work, and the Better Working Spreadsheet allows you to do this with any properly interfaced Commodore-compatible printer. The program can also print out your data in the form of a high-resolution bar graph.

This spreadsheet is easy to use and is loaded with features. Its documentation ranks with the very best I've seen. Commodore 64 owners should welcome the Better Working series of home and small-business software with open arms. Bravo, Spinnaker! *(Spinnaker Software, One Kendall Square, Cambridge, MA 02139. C-64/$49.95 disk.)*

Ken Silverstein
Salem, NH

Eureka!

B

A Larger-than-Life Game To Challenge even the Most Seasoned Adventurer

Subtitled "250K of Pure Mystery," Eureka! is perhaps the grandest attempt yet in adventure gaming. But the key word here is attempt.

The scenario is this: The Temporal Talisman (a crystal cube) was brought back from the moon by one of the Apollo missions. Under examination by powerful lasers, the cube shattered into eight pieces. Three were found rather quickly, scattered about the globe, but you must locate and retrieve the other five. Unless you do, the moon will disintegrate and shower the earth with meteors.

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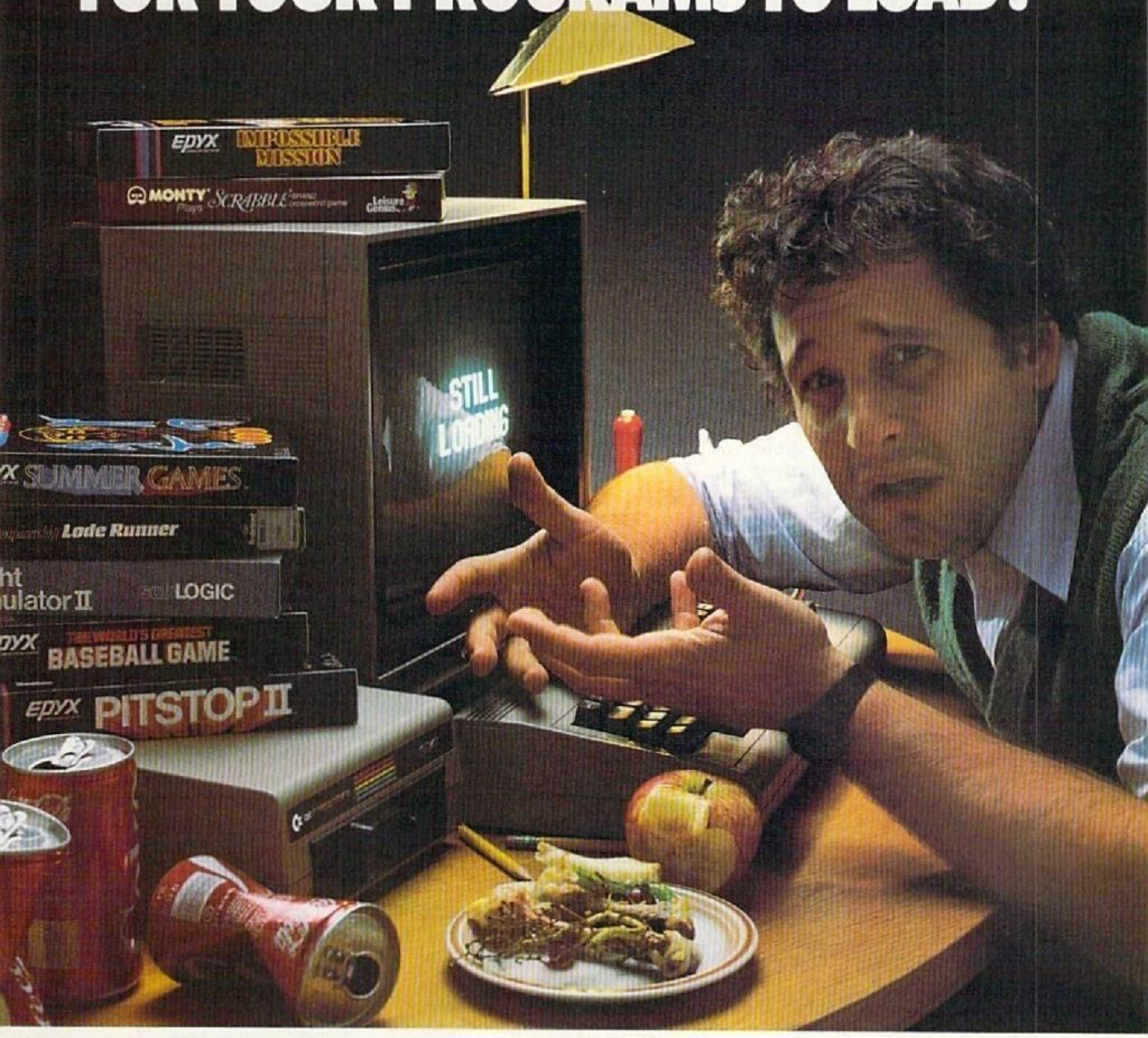

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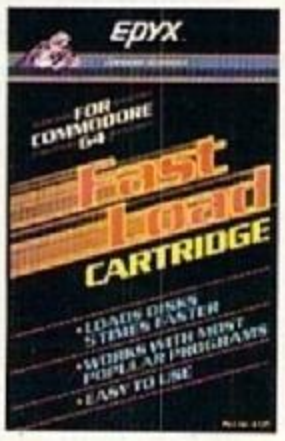

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The remaining pieces of the talisman have been scattered through time. Each area of search is a text-and-graphics adventure.

If all this seems made up of elements from *The Time Machine*, "Dr. Who" and James Bond, you're probably right. And with such illustrious antecendents, how could Eureka! possibly go wrong?

One main drawback is that the documentation is too sketchy. A list of single-key commands is given (such as S for south and N for north), but that's as far as it goes. When playing an adventure, I want to be able to concentrate on the large mystery of the game, not the smaller mysteries of discovering which words the parser will understand.

Life is rather short in this game; while trying to find the word or words that will allow me to avoid jousting with the black knight, I am run through by his lance. A partial listing of commands would have made this adventure more enjoyable.

Besides the five text adventures, there is an arcade game that you must play in order to acquire vigour—what we on this side of the ocean would call strength. Vigour is necessary for combat and survival. However, you are on your own in discovering how to play the arcade game, because the description in the documentation bears no resemblance to what I found on my screen.

The Eureka! manual contains a picture and a riddle for each adventure, and you must work with all three elements simultaneously if you are to have any hope of solving the mystery.

Each chapter, or adventure, is a mystery in and of itself, yet it is only a small part of the grand mystery. As you search for the crystal pieces, you should also be collecting clues toward the ultimate solution.

Knowledge gained in the early adventures will help you solve the later ones, and you can piece together the clues to yield a telephone number and a secret code. Be the first to call the London number and speak the code, and you'll be rewarded with a prize of $25,000.

Because the graphics never occupy more than one-third of the screen (and frequently less), you'll strain hard for visual clues. Yet I must say that the animation in some of the frames is superb and the sound is terrific—a lonely wind whistles through Sherwood Forest and hoofbeats resound during the joust.

In summation, Eureka! is a grand attempt that falls short because of poor documentation. Hardened adventurers may love it, but beginners will find it extremely frustrating to keep dying after only a few moves. This is, indeed, mystery on an ambitious scale. *(Handic Software, 400 Paterson Plank Road, Carlstadt, NJ 07072. C-64/$39.95 disk.)*

Ervin Bobo
St. Peters, MO

Beach Head II

C

This Sequel Never Quite Matches the Excitement Of the Original

After months of anticipation fueled by magazine ads in the style of movie posters, Access Software has finally released Beach Head II. This is the sequel to what many consider to be the best arcade-style contest of military might. Not only did the original Beach Head set a standard for programming excellence, but the completeness and continuity of the game's story line elevated it way above the level of a simple shoot-'em-up.

Unfortunately, like most movie sequels, Beach Head II never quite lives up to the original production.

Picking up the story where Beach Head leaves off, Beach Head II pits the heroic commander of the Allied forces against the evil dictator, known to his friends as the Dragon. The four-part Allied mission is to storm the Dragon's sanctuary, rescue the hostages captured during previous battles and fly a daring helicopter mission to get them off the island. Finally, the Dragon must be eliminated in a deadly showdown.

In all but the helicopter escape sequence, you may play the part of either the Allied commander or the Dragon by choosing the appropriate joystick. The computer will automatically take control of the other side. There is also a two-player option that lets you battle it out against a friend.

The game features some nice voice simulation. For example, when Allied troops are gunned down by the Dragon's machine gun, they call for the medics, yell, "I'm hit" or simply groan in pain.

Easily the best of the game's sequences, this Attack screen features several soldiers realistically parachuting from a helicopter, climbing over walls and hurling hand grenades at the Dragon's machine gun.

In the second sequence, the Allied forces have captured the Dragon's machine gun and must use it to protect escaping prisoners as they walk across a courtyard. If you're quick enough, you'll be able to help the prisoners make it to safety. (If you've seen the game called Crossbow, this scene will seem awfully familiar.)

The third scenario is an unimaginative scrolling shoot-out between the Allied helicopter and the dictator's tanks and automated defense system. This sequence uses no voice simulation, and the scenery, though colorful, is nothing out of the ordinary.

The grand finale features the commander and the dictator hurling poontas (an ancient weapon) at each other from opposite sides of an underground river. Although the graphics on the board are very well done, and I understand the drama the designers were attempting to create with a one-on-one showdown between good and evil, there is something anticlimactic about two great military leaders settling the score with sharpened sticks.

If you liked the original Beach Head, you'll probably be bored with Beach Head II. The game's four sequences are related only by the instruction booklet, and they lack the depth and strategic elements found in the predecessor. Beach Head II may talk, but the original had a lot more to say. *(Access Software, 925 East 900 South, Salt Lake City, UT 84105. C-64/$39.95 disk.)*

Bob Guerra
Charlestown, MA

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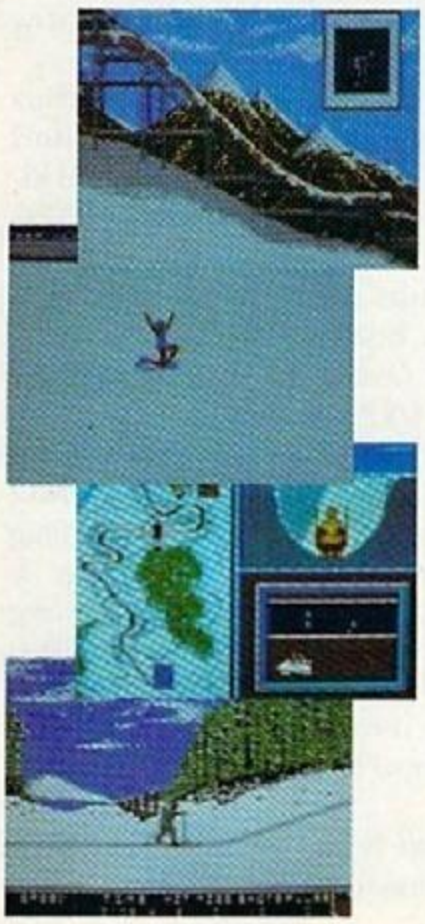

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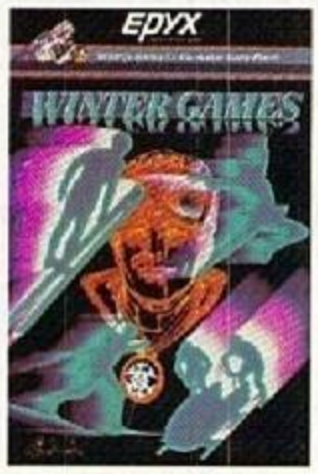
Winter Games	✓	✓	✓



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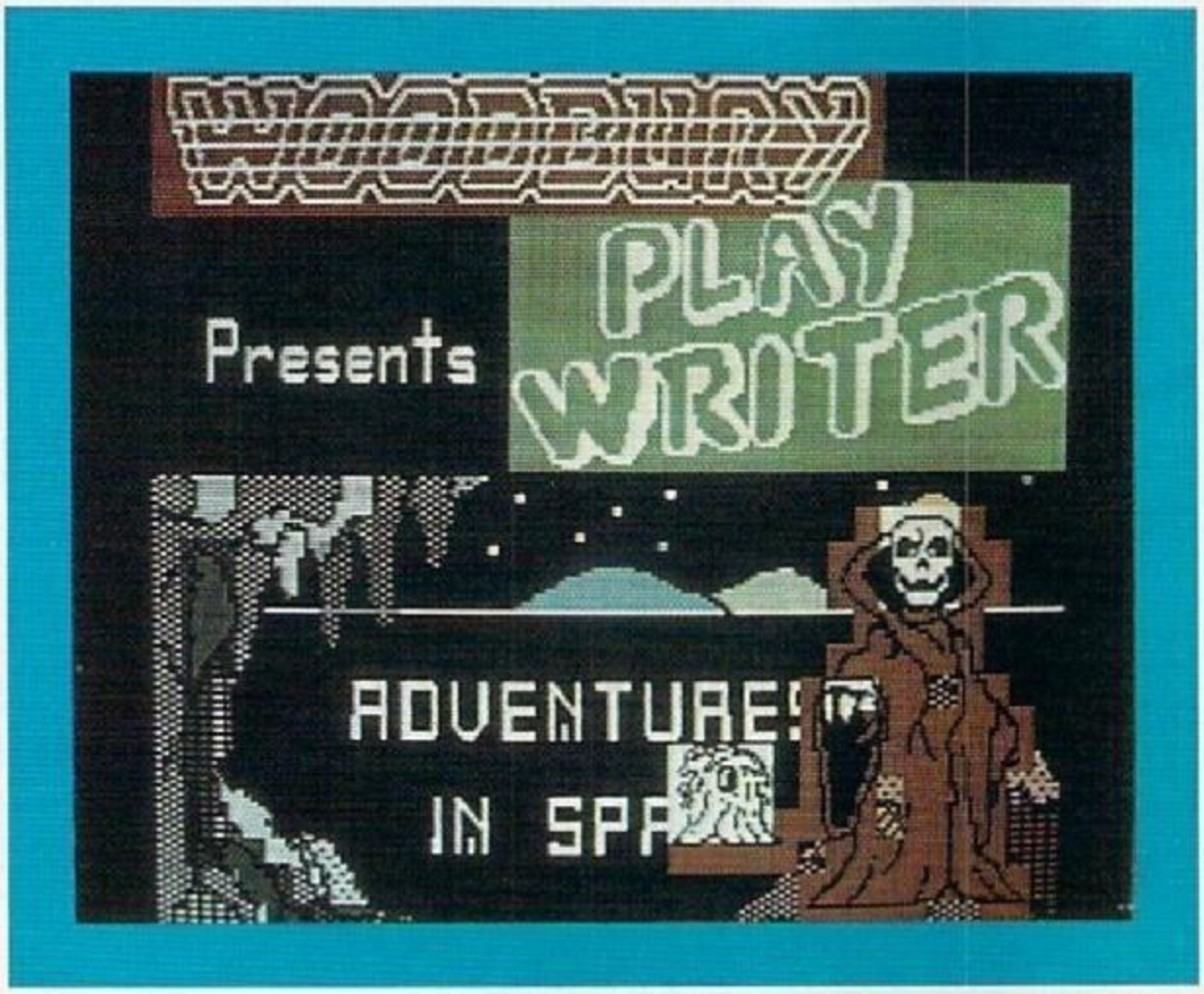

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Completely menu-driven, with prompted multiple choices at every step of the way, PlayWriter will provide a good outlet for your child's imagination and a book that is both readable and interesting.

At the beginning, you are asked to choose a title for your book. Select one of the two offered or create your own. Next, you are prompted to enter your first and last name. This creates your byline.

Like text adventures, where opening one door reveals more doors to be opened, the multiple choices offered in PlayWriter lead to an almost infinite number of possible events. Because it is unlikely that you or your child will always make the same choices, you will probably never write the same story twice.

Stories may be saved to disk (two on the master disk and more on a blank disk).

You may be asked to decide the criteria by which a space adventurer is chosen. Three choices are printed on the screen and the Other option allows you to make up your own. A paragraph will then be built around your character, and it will be remembered in subsequent chapters.

My daughter chose "awesome" as her favorite exclamation of surprise and delight. Her heroine then goes through the story saying "awesome" as new surprises present themselves. In the writing of fiction, repetition of a trait helps define a character, and so it is here. If you forget to be consistent in your answers, the program will provide at least a small measure of consistency for you—a nice touch.

When a chapter ends, you can edit that chapter or, if the creative juices are still flowing fast, go right on to the next.

Should you decide to edit, it will be at this point that you can first read your fleshed-out story. A rudimentary word processor allows you to correct spelling or completely alter the course of your story. But a word of warning—if you decide to change "awesome" to "wow," you'll have to do it for every occurrence, as search and replace is not a function of this program. Editing is done one paragraph at a time.

You may print to plain paper, to plain paper in book format, or, if you're really sure this is the best you can do, print to the 5- × 7-inch perforated paper included in the package. It is this that will be bound into your book.

In the blank spaces of your manuscript, you may insert the colorful stickers provided (or any other stickers you choose). For prolific writers, paper and sticker refills are available from Woodbury.

Because there are so many choices, and because your choices must be digested by the story-making machinery, there are times when the disk must be accessed for new material. To help ease the boredom while waiting, a riddle appears on the screen, and youngsters can mull over their answers while the mundane tasks are being done—another nice touch, proving these people really know their audience.

For its ease of use and its obvious educational value, I give PlayWriter/Adventures in Space high marks. And I was even more pleased that its use of real tools from the craft of fiction results in so readable and interesting a book. *(Woodbury Software, 127 White Oak Lane, Old Bridge, NJ 08857. C-64/$39.95 disk.)*

Ervin Bobo
St. Peters, MO

Editor's note: Woodbury Software, along with Grolier Electronic Publishing, is sponsoring The Great American Writing Contest, a competition for children that is based on the PlayWriter series of programs. PlayWriter/Adventures in Space will be assigned to students in grades four and up.

Stories will be judged on content, originality, grammar, spelling and overall ef-

Continued on p. 144.

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The Eidolon	✓	✓	✓

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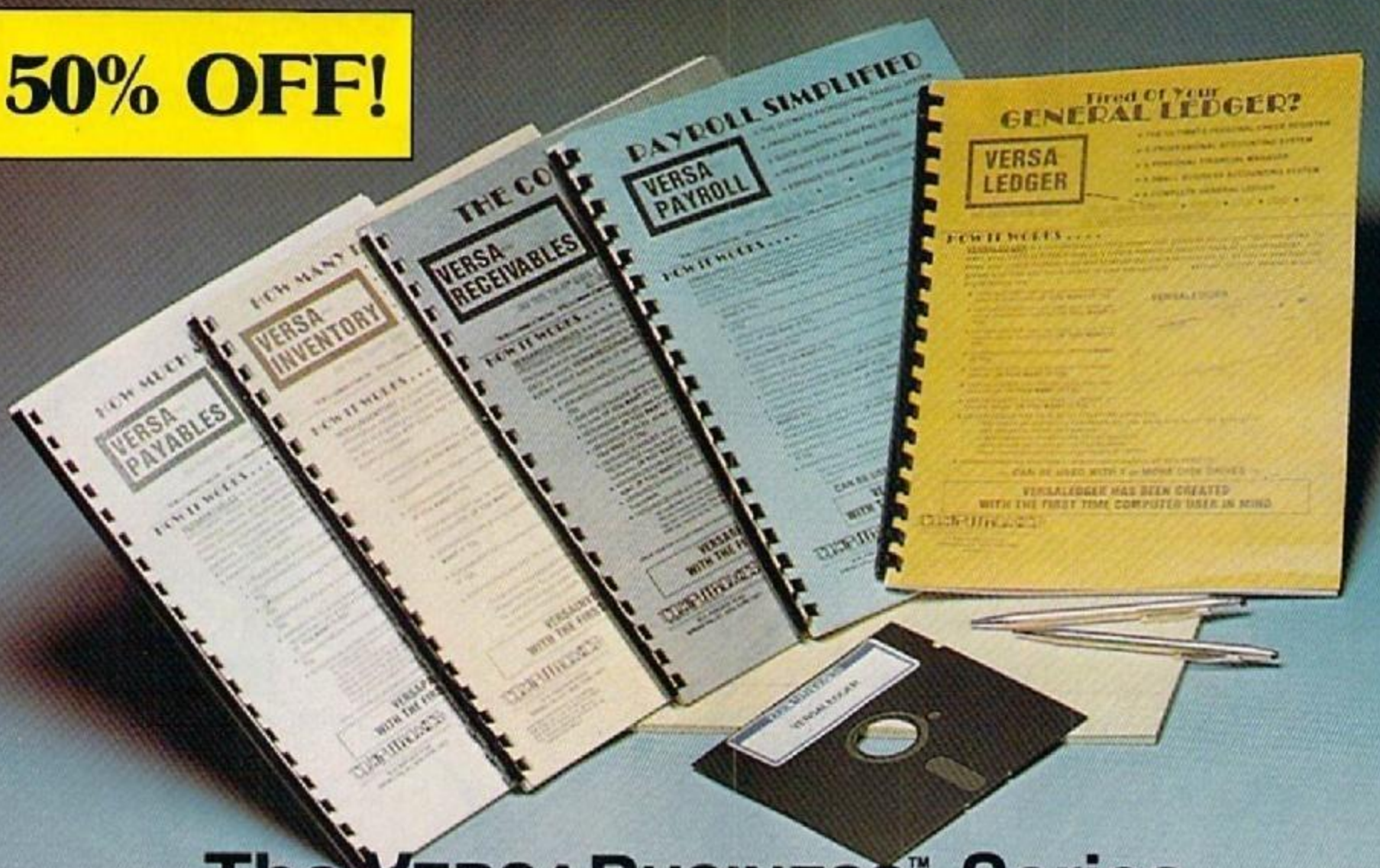

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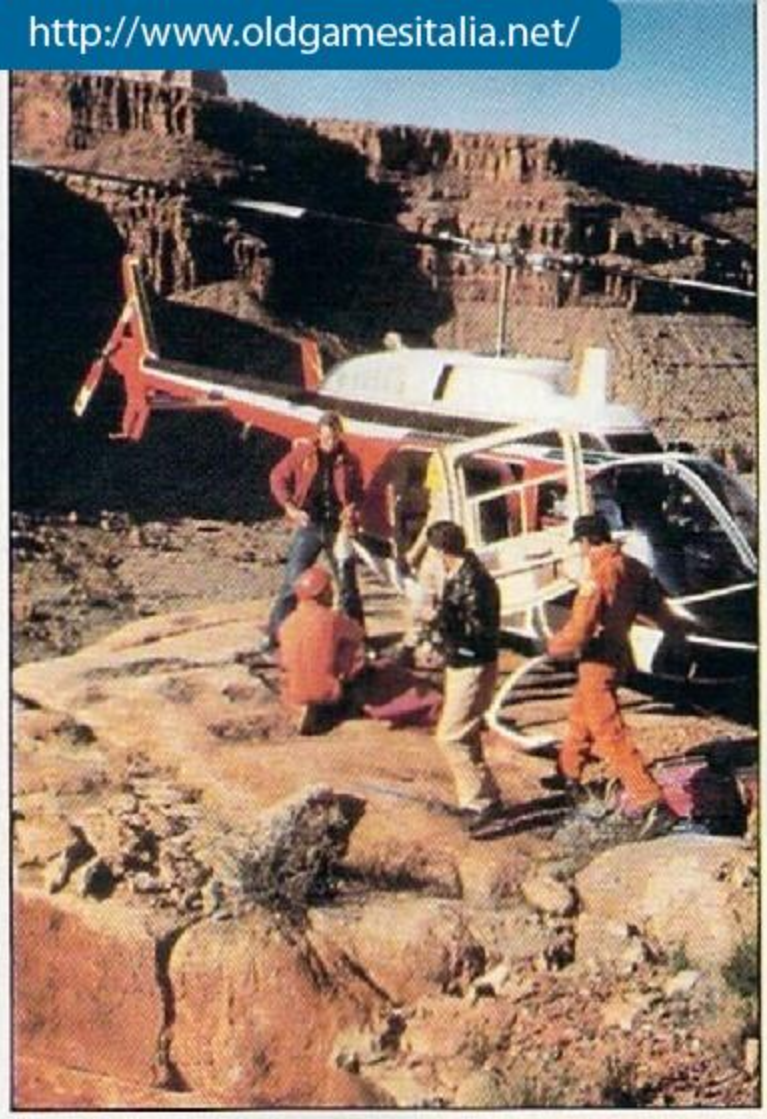

To

"It's a sign of the times: Computers are being used effectively in a variety of situations. And if we're really going to do our job of search-and-rescue, we have to use a computer, especially in large-scale operations."

Sgt. Charles McHugh
Former Search-and-Rescue Coordinator
Pima County Sheriff's Dept.
Tucson, AZ

By S.F. TOMAJCZYK

Rescuers out west are enlisting the aid of a unique Commodore program that helps locate missing persons. Its remarkable success rate has even captured the interest of the U.S. Navy and Air Force.

As any rescuer can readily attest, finding a lost person can be both frustrating and difficult. That's because people are unpredictable; they cross highways, walk in circles, don't signal for help, and so on.

It's therefore not surprising that in this real-world game of hide and seek, the chances of locating lost people before it's too late have always been slim. Searchers have usually been forced to rely more on their so-called seat-of-the-pants judgment than on any other rescue methods.

But, thankfully, time has a way of changing things. Today there is a way for searchers to combine gut feeling with hard evidence to find the elusive victim—a marriage of the Commodore 64 to a computer program by the name of CASIE.

In a Nutshell

CASIE (Computer-Assisted Search Information Exchange) is a Basic program that uses available search data to determine the *probability* of finding a lost person in a certain location; it *does not* actually find the victim. This probability of detection, referred to as the POD, is instrumental in helping the search manager decide where to look for the person and with what means (e.g., dog teams, helicopters, infrared devices, ground crews).

For instance, CASIE might determine through available information that there's a 57% chance of finding the lost person in a specific river area. Therefore, the search manager would be inclined to search that region before any others. And because there's water, the manager would probably decide to send in a helicopter rather than a dog team, knowing that the river might have erased traces of the missing person's scent.

CASIE is the brainchild of Dr. John Bownds, a research member of the Oak Ridge National Laboratory, and Dr. David Lovelock, a mathematician at the University of Arizona. Their interest in the application of probability theory and computers in locating lost people stems from their own

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involvement with search and rescue—Bownds as a field operator and Lovelock as a radio operator—in the Tucson, Arizona, area during the late 1970s.

The seed for CASIE was planted in 1979 by Sgt. Charles McHugh, then Search and Rescue Coordinator of the Pima County Sheriff's Department. He approached Bownds and Lovelock about some literature that he had picked up at a seminar given by the National Park Service.

The literature speculated on the future role of computers in rescue operations. After reviewing the information, both men felt that the presented data was accurate and that they could develop it into a computer program.

The opportunity to back up their words happened in 1980, when Bownds was hospitalized for meningitis, contracted during a rescue mission in the Sonoran Desert. While recuperating, he developed the CASIE prototype on a TI-59 programmable calculator that his wife had bought him.

"CASIE ran around inside my head while I was hospitalized," Bownds said. "As a physical and mental exercise, I learned how to program the calculator; CASIE finally came out."

Lovelock subsequently translated Bownds' TI-59 efforts into Basic on his Commodore 64. According to Lovelock, he and Bownds selected Basic for two reasons: It's easy to program and to teach people.

Looking for the Numbers

In typical localized search missions, where the victim is usually found within just a few hours of having been reported missing, CASIE is not normally used. That's because the program in its present state would be more of a hindrance than an aid (much like using a chain saw when a handsaw would suffice).

However, when an extensive search operation involving hundreds of people and aircraft is required to find a missing victim, CASIE works like a charm. Such large-scale rescue missions are usually launched when the victim has been lost for several days or when the search manager senses from the start that finding the person is going to be difficult, due to the weather or terrain.

In these instances, all the rescuers are brought together for a conference. The facts of the case are discussed and a decision is made on how to segment the search area; then a consensus is taken on the POD of actually finding the victim in any one of the search grids. If it's done properly, the sum of all the sector PODs adds up to 100 percent.

These quasi-subjective POD figures are then fed into CASIE to calculate a maximum, minimum and average POD for each search sector. With this in hand, the search manager has a better idea of where the victim might be found. He can then distribute his search forces more wisely and accurately.

"We once created a program on the Commodore that depicted the POD figures by color," mentioned Lovelock. "A shade of red in a search grid indicated a high probability of finding the victim there; blue indicated a low probability. It *looked* great, but John and I quickly decided to go back to our old way. Seeing a number like 82.6 percent meant more to us than seeing bright red. Besides, who can tell the difference between an 82-percent red and an 83-percent red?"

Throughout the rescue mission, Lovelock and Bownds can be found in the command center playing "scenarios," a never-ending game of asking, "What if. . ." (e.g., "What if the victim is injured and unable to move? How will this affect the POD figures for each of the search grids?").

Answering these questions and continually updating the POD figures as information from the field reaches the command center gives the search manager a better idea of what he's confronted with and helps prepare him for any sudden changes that might occur. (The discovery of footprints, for example, would have

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```
PROBABILITY VICTIM IS IN AREA 1 = 20%
PROBABILITY VICTIM IS IN AREA 2 = 35%
PROBABILITY VICTIM IS IN AREA 3 = 15%
PROBABILITY VICTIM IS IN AREA 4 = 10%
PROBAB VICTIM NOT IN SEARCH AREA = 10%
WHICH AREA HAVE YOU SEARCHED ? 1
POD FOR TEAM SEARCHING AREA 1 ?
PLEASE WAIT—WORKING HARD AGAIN...
PROBABILITY VICTIM IS IN AREA 1 = 4%
PROBABILITY VICTIM IS IN AREA 2 = 42%
PROBABILITY VICTIM IS IN AREA 3 = 18%
PROBABILITY VICTIM IS IN AREA 4 = 18%
PROBABILITY VICTIM IS IN AREA 5 = 12%
PROBAB VICTIM NOT IN SEARCH AREA = 6%
WHICH AREA HAVE YOU SEARCHED ? 2
POD FOR TEAM SEARCHING AREA 2 ?
```

Figure 1. *Sample of CASIE printout.*

a dramatic effect on the POD for the sector in which the prints were found.) It's not uncommon for the rescue mission to suddenly be redirected to another sector after such efforts, often with success.

At the end of each day, CASIE is used to generate a report on the cumulative and daily search progress (i.e., changing POD figures for each search grid), so that rescue personnel can see and confirm the results of their efforts. This is an invaluable aid when the search continues beyond a few days.

"If the search for a missing person goes on for a long time," explained Lovelock, "everyone gets very tired and emotionally drained, especially when there's a child involved. At times like these, it's nice to have a computer that isn't tired or emotionally involved and that just generates the numbers.

"It's reassuring that the numbers come out the same way the search manager feels they should; it has a stabilizing effect and keeps the manager honest before he makes the decision to call off the search. You see, very few people—other than scientists—have the ability to live in a vacuum."

Searching High and Low

To date, CASIE has been used extensively in search-and-rescue missions from the Sonoran Desert to the Grand Canyon, and has managed to find 90 percent of the people reported lost or missing.

In one notable instance concerning a woman lost in the Grand Canyon in midwinter, CASIE recommended that the search teams look in an area that most of them hadn't really considered as being a likely spot for the woman to be found: a steep and narrow canyon. A search team was sent in to investigate, and, lo and behold, there she was—cold but alive.

Such an impressive batting average has caused many people to believe erroneously that CASIE can find anybody or anything that's lost. However, as Lovelock readily points out, CASIE's accuracy is based on two factors: the quality of the information put into the program (the old garbage-in, garbage-out theory) and the effectiveness of the search teams.

With reliable information and search teams, though, CASIE can do wonders. The program has been used to help determine the whereabouts of crime victims (in this instance, a nine-year-old child who was murdered) and also escaped criminals. Bownds and Lovelock were even recently approached by military representatives who had heard about CASIE's list of accomplishments.

"The Navy," said Bownds, "has expressed interest in CASIE from the point of view of trying to hook it into their on-board computers searching for underwater targets like submarines—our own and the enemy's. And Scott Air Force Base, which is the central rescue center in the United States, has expressed *great* interest in developing this computer system to locate downed planes and boats."

Other potential applications for CASIE—with the proper changes and modifications—include helping to find American MIAs in Vietnam or missing children here in the United States. It's important to note, however, that such speculations and ideas are presently just that: purely speculative.

"I would imagine that given the right scenario, yes, we could be useful over there in Vietnam," said Lovelock. "But it's the same as anything else; if you don't have a gut reaction as to what's happened, then it's unlikely that we can program it. In other words, if you've got a lot of experience and the signs don't mean a thing to you, then it's unlikely we'll be able to put anything into the computer that makes sense out of it."

Future Plans

CASIE's development is the proverbial never-ending story: Bownds and Lovelock are forever tinkering with the C-64 version of CASIE to make it more powerful and more intelligent. And Bownds is taking this even one step further: He's currently attempting to raise funds to build a prototype CASIE expert system.

"What we're trying to do is apply the CASIE program nationwide," he said. "The system we envision will be a computer network with a mainframe at its center. The mainframe will do all the calculations for the information exchange and send by modem the updated search information for the search management team to review.

"The size and speed of the mainframe will allow for several rescue missions to be coordinated at once. Right now, there are only two people who can operate CASIE: David and me. And we're doing a lot of work that the program should be doing instead. By nationalizing CASIE and making it more intelligent—hopefully to the point where it begins to learn from its own experiences—we can have a very sophisticated program, capable of simultaneously and accurately finding numerous victims in different parts of the country.

"If that can happen," Bownds continued excitedly, "all a search manager will have to do is phone into the network system via computer and modem, input the details of the search-and-rescue mission at hand and then wait for CASIE to do the computations and send back the results. He doesn't have to know any mathematics at all."

Bownds is convinced that such a nationalized search-and-rescue expert system is not too far in the future. In fact, he predicts that with proper funding, he and Lovelock could have a prototype network up and running in two *very* intense years. And he foresees a fully operational expert system to be in existence by the turn of the century.

Indeed, a bright future appears to lie ahead for CASIE, whether in locating missing children or tracking down enemy submarines. Granted, to eventually become a reality, this development process will require hard work and self-sacrifice on the behalf of Dr. Lovelock, Dr. Bownds and many other people, but they are determined to make it a reality. The Commodore User's Club in Tucson, Arizona, for example, has already raised over $3500 for CASIE, with the goal of achieving a total of $25,000.

And for those in the lost-and-found business, seeking and discovering alternatives is what it's all about. R

S.F. Tomajczyk is an author-journalist whose articles have appeared in a variety of national publications.

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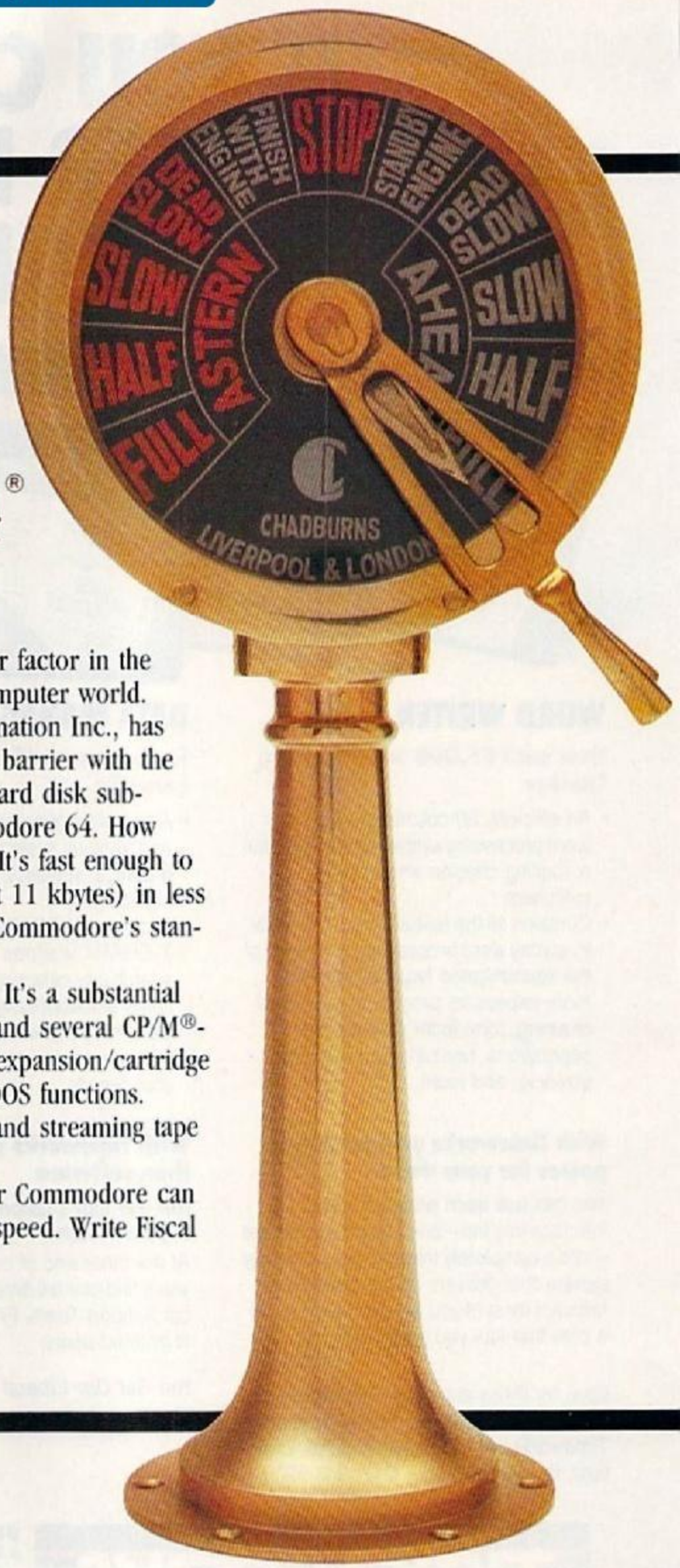

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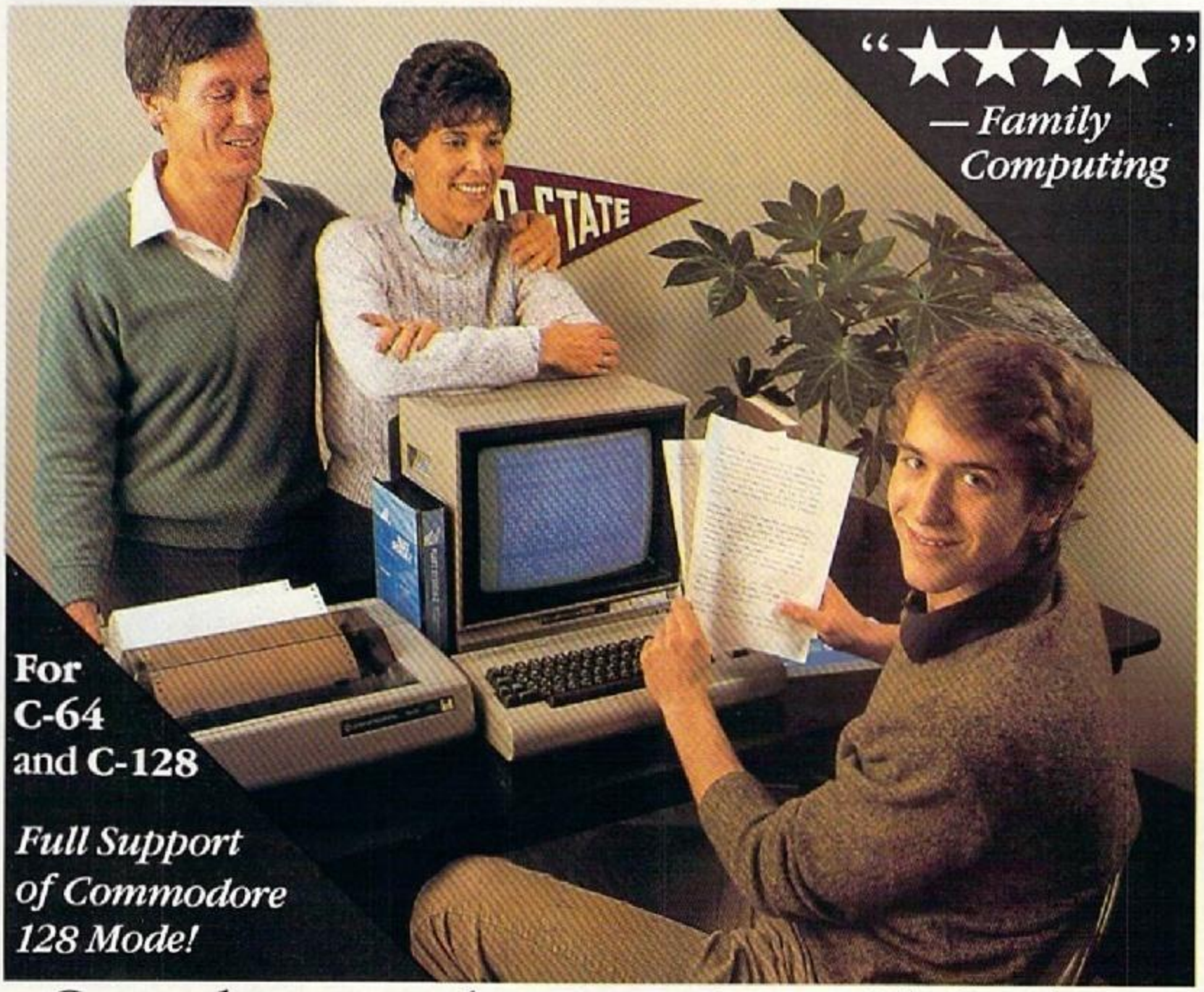

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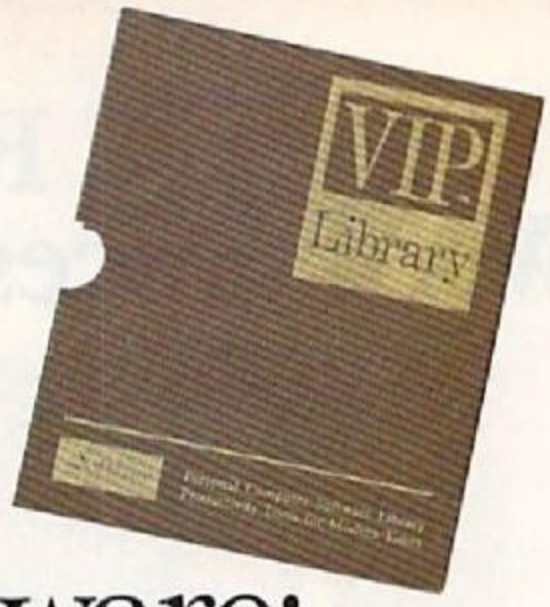
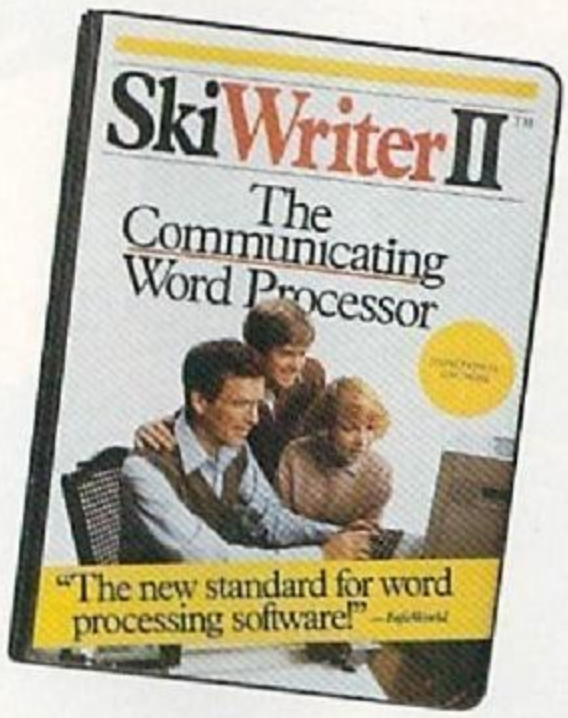
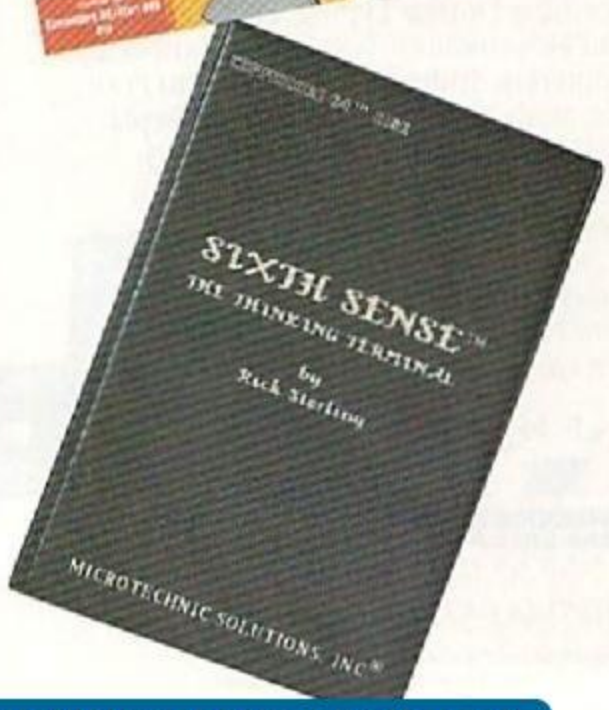
Are you interested in telecommunications, but don't quite know where to begin in setting up your system? This overview of several popular terminal packages will help you decide on the software that's right for you.



Communications Software: A Vital Link

By JIM GRUBBS





Chances are that if you've owned your computer for more than a few weeks, somewhere along the line you have read about or come in contact with the idea of communications by computer. It certainly sounds easy enough. Indeed, there is no reason for telecommunications to be out of anyone's reach.

Often, what should be simple becomes complicated in the real world. That's true of software for computing via telephone line. It's much easier with a friend to guide you along the way.

You need two major additions to your computing setup to enjoy telecommunicating. The first is a piece of hardware called a modem. Previous articles in *RUN* have taken a look at some of the best available, and future reviews will include a look at several new, high-speed modems, such as the 1200-baud 1670 modem from Commodore. The second addition is the terminal software; that is, the program you need for computing by phone line.

Over the months, you've been reading in *RUN* about the many services that are available when you hook up your Commodore 64 or 128 to your phone line. Some of these services, such as PlayNet, come with their own software that is specifically designed to communicate over one particular system. CompuServe even has a special software package, called Vidtex, that is available for C-64 owners. It's a bit different in that it can be used for other telecommunicating as well.

Know What's Available

Selecting a terminal package is not unlike buying a car. Some packages offer only the basics, while others are super-stocked with every option imaginable. Just like cars, software comes in all colors, sizes and price ranges.

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It's unnecessary for you to learn all about the technicalities of how your computer communicates via modem in order for you to decide on the right terminal package. There are, however, certain pieces of information you do need in order to make your setup work. As long as you stay with the popular on-line services or local bulletin board operations, you shouldn't have too much difficulty. If you are going to try connecting to business computers, you may find setting up your system a bit more difficult.

Why not one standard for all telecommunications? Really, there *are* some standards. However, even subtle variations in transmission can render a circuit uncooperative if you do not match the correct signal.

All of the programs discussed here will accommodate just about all of the common variations that you are likely to encounter in your telecommunicating. They will all operate at standard speeds of 300- and 1200-baud, and they can all be set for proper word length and parity.

For basic telecommunications, any of these packages will work well. On the other hand, if your interest in telecomputing is mainly in accessing the wide variety of software that you can download, then you need to take a special look at what types of downloading are supported by each package. That is an important factor that I'll elaborate on in a moment.

Finally, if you are tying into a system designed to work with professional terminals such as the DEC VT-100, you may need an even more sophisticated software package.

If you already have a modem, it probably came with a terminal program of some kind. Commodore owners originally received VicTerm with the 1600 and 1650 modems. More recently, HiggyTerm has been packaged with the 1660. Incidentally, it's one of the few existing terminal programs for the Plus/4, and it is available for downloading on the Commodore Information Network (on CompuServe). Even though it's for the Plus/4, you can download it using a C-64. Perhaps the best part is that it's free!

VicTerm is a real bare-bones terminal program. With it, you can log on to local bulletin boards and even CompuServe and The Source. However, you can't save messages or send files, nor can you download programs. The program's limitations become obvious pretty quickly.

If you are fortunate enough to have HiggyTerm, you do have quite a few more features available. You can capture information and programs in its buffer, but it lacks true uploading and downloading provisions.

Protocols

If you have a terminal package that has uploading and downloading capabilities, an almost limitless supply of public domain software is available to you. The catch is that there are several systems being used to accomplish such public domain program transfers.

The three most popular systems for the Commodore are Punter, XModem and CompuServe B protocols. A fourth, called ASCII transfer, is also available on most systems. It's not a true transfer system, however, and requires you to do some manipulation in order to send or receive programs.

All three systems have a common goal: the error-free transfer of information from one computer to another.

Just as you sometimes misunderstand something that is said over the phone line because of static or a weak connection, your computer can misunderstand an incoming signal. Even a single error in a 16K program will keep it from working. Transfer protocols were invented to help ensure that if an error occurs, the sending computer retransmits the part of the program that was sent incorrectly.

The granddaddy of such systems is XModem. It has been around for a long time and there's a version of the program for nearly every computer on the market.

The Punter protocol is very similar, though it's designed specifically for Commodore machines. Many Commodore-specific bulletin boards use Punter protocol, largely because Steve Punter also wrote bulletin board software that is still in wide use.

Until quite recently, CompuServe B protocol was available only on CompuServe's Vidtex software package. It has been licensed to others and is now included in several terminal packages. CompuServe also now supports XModem transfer, so the need for special compatible software is not as great as it used to be.

All of these systems ensure the integrity of the data by computing and sending a checksum to the receiving machine. There, it is refigured. If the data is acceptable to the receiving computer, the process is completed. If not, the receiving computer sends a request for retransmission.

ASCII Transfer

Before moving on, let's take a brief look at ASCII transfer.

By using a special utility program, you can take a program file from disk or tape and convert it into a sequential file that contains the standard ASCII codes. (The program is "listed" to disk or tape.) That file can then be sent to another computer in the same way that you would send a regular message, since it is nothing but letters and numbers.

On the receiving end, the file can be captured as a sequential file and then converted, using another utility program.

This system is not without its limitations. For one thing, no error checking is done, so the file may not come through correctly.

Secondly, standard ASCII only recognizes 128 different combinations of characters, while your Commodore computer uses 256 different combinations.

When using a special protocol, such as XModem, everything is sent as a hexadecimal value; thus, the peculiarities of Commodore ASCII are not a factor. Using ASCII transfer, however, some characters will come through in an altered fashion.

If you are just starting out, I would recommend that you use either the terminal package that came with your modem or one of the many available public domain packages to log on to the systems that interest you, and then find out what techniques they use. With that information, you will be in a better position to select a communications package.

Let's jump in and take a look at several of the most popular terminal packages available. Some of the programs have so many features that it's impossible to list them all. Using these reviews as a guideline, you should be able to zero in on several packages to investigate further.

Smart 64 Term/Plus 4

Don't let the name of this one fool you. When I first saw it advertised, I thought I had found a full-featured program for my Plus/4 computer.

Smart 64 Terminal, from Microtechnic Solutions, has been available for some time. The "Plus 4" addition refers to the current enhanced edition of the program that contains some added features.

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• Radar	Yes	Yes	No
• Electronic Counter Measures	Yes	Yes	No
• Inertial Navigation	Yes	Yes	No
3. Real Combat Missions	Yes	Yes	No
4. Developed and Tested by Real Fighter Pilots	Yes	Yes	No
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Major Features of Programs

	Smart 64/ Plus 4	Vidtex	HomePak	Skiwriter II	SuperTerm	Sixth Sense	VIP XL
supports XModem	✔		✔		✔	✔	✔
supports CompuServe B		✔**				✔	no**
supports Punter					✔		
supports ASCII	✔	✔	✔	✔	✔	✔	✔
text editor			✔	✔	✔	✔	✔
VT-100 emulation					✔		
screen size	80*	40	40	40	80	40	40/64/106
split screen			✔			✔	
retail price	$39.95	$39.95	$49.95	$69.95	$89.95	$89.95	$39.95

*Available only through hardware expansion
**Supports CompuServe graphics

This chart highlights some of the major features of these telecommunications packages. All of the programs will work with most popular modems available.

Smart 64 offers a wide range of features. It supports XModem protocol. It also comes with utilities for converting text files into program files. One very nice feature is that Smart 64 supports several popular 80-column cards, such as the Video Pak 80 and XL-80 from Data 20 Corp., and BI-80, from Batteries Included. A wide range of modems are also supported by this software.

If you find you need to communicate with a system that uses ASCII codes in a somewhat different way than most machines, this program offers a special conversion table that can be modified to suit your needs. I should mention again that Commodore ASCII is not standard and must be converted in order to communicate properly with other computers. All terminal programs for the Commodore do this, but few give you the power to customize the translation.

Microtechnic has included help screens that you can call up from within the program. This is a handy feature, particularly when you are first starting out.

Smart 64 does not contain its own text editor. Rather, it is compatible with files created by Easy Script, PaperClip, Wordpro and Script 64. This allows you to create your messages off-line to save connect charges when communicating over one of the pay services.

A 45-page manual is included with Smart 64. Like many programs, I found it took some time for me to learn to operate the program. It did perform well once I got through the learning process. Microtechnic Solutions is unique in that it offers a customer service BBS.

One final note about Smart 64 Terminal/Plus 4: A special version of the program is available that works with the COMvoice speech synthesizer. This should be of special interest to blind computerists. *(Microtechnic Solutions, PO Box 2940, New Haven, CT 06515.)*

Vidtex

Vidtex is the trade name of CompuServe's video text service. Special software for the Commodore 64 is available that takes full advantage of the graphics capabilities of this system.

CompuServe has also developed its own special uploading and downloading system, called B protocol. It is now licensed to other companies, but for a long time, the only way to take advantage of this easy-to-use system was by purchasing Vidtex.

The Vidtex package is a full-featured program that is quite usable on many on-line systems other than CompuServe. The B protocol is the only one supported by Vidtex, though ASCII file transfers can be done using the program's buffer. No text editor is included.

Vidtex is most recommended for two applications. If you plan on taking full advantage of the color graphics that are available in some areas of CompuServe, Vidtex is a must. And, if you like to do a great deal of transferring of files and programs specifically to and from CompuServe, I highly recommend Vidtex. When using it, you don't even have to select what protocol you will need. The CompuServe system queries your machine automatically and prompts you with simple statements to get the job done.

Vidtex is by far the easiest and most accurate way to download and upload when you're using Compu-

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking ***quality*** printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your computer.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 35 character styles including 13 double width and 3 reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry

machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.

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Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4 to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, labels, anything you choose. Any size to 10" in width. In fact this unit is so advanced, it will load your paper automatically. Multiple copies? Absolutely! Use forms (up to 3 thick). Do you want to use spread sheets with many columns? Of course! Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" wide page, and you can do it quietly. The SP-1000 is rated at only 55 dB. This is quieter than any other impact dot matrix printer that we know of and is quieter than the average office background noise level.

Consistent Print Quality

Most printers have a ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade. To keep the printers output looking consistently dark, the ribbons must be changed quite often. The SP-1000 solves this problem by using a wide (½") ribbon cartridge that will print thousands of pages before needing replacement. (When you finally do wear out your ribbon, replacement cost is only $11.00. Order *#2001.)*

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Serve. *(CompuServe, 500 Arlington Centre Blvd., Columbus, OH 43220.)*

HomePak

To switch gears for a moment, I'd like to discuss two communications programs that come as part of an integrated software package.

HomePak contains a surprisingly versatile terminal program, called HomeTerm. The package also includes a word processing program and a simple database manager. As you would expect, text files created using the word processor can be transmitted directly with the communications software. With the word processor, you can easily edit files that you have captured over the telephone line.

Perhaps the most pleasant surprise you'll find in HomeTerm is that XModem protocol is supported by this package. That makes program transfer a breeze, even on CompuServe. This package also includes a Vidtex option that eliminates the strange codes you sometimes see if you are not using Vidtex when logging on to CompuServe.

Another of my favorite features is the Buffered Send option, which allows you to type in a maximum of 80 characters without sending them. If you are a ten-thumbs typist, this can be a real advantage. It is also a great feature when you're using the CB simulator, allowing you to compose your message in a separate part of the screen.

HomeTerm's receiving buffer is only about 11K bytes, which is a bit small compared to some. I did find the character set a bit difficult to read on my screen, but, all in all, was very impressed with the clearness of the program's instructions and ease of operation. *(Batteries Included, 30 Mural St., Richmond Hill, Ontario, Canada L4B 1B5.)*

Skiwriter II

Another integrated package is Skiwriter II. Skiwriter comes in cartridge format. It may only have been my unit, but I found it difficult to determine which side of the cartridge was supposed to face up, due to the way it's labeled. Without forcing it, the cartridge will go in only one way, so that was just a minor problem.

I found the word processing portion of Skiwriter to be more than adequate. The instruction manual is clear and concise—a pleasure to read. With the program on cartridge, switching from word processing to telecommunications is instantaneous.

Unfortunately, Skiwriter supports only ASCII file transfer. That works fine for transmitting text, but not very well for programs.

If you find cartridges more convenient and you intend to use the telephone connection mainly for sending text files, Skiwriter should work well for you. *(Prentice-Hall Home Software, PO Box 819, Englewood Cliffs, NJ 07632.)*

SuperTerm

Midwest Micro was one of the early pioneers in providing communications software for Commodore machines. Many of us started with the Terminal 40 for the VIC-20, which allowed for a 40-column screen created by software.

Several years ago, I needed to be able to communicate with a minicomputer at work that was designed to talk to VT-100 terminals. The SuperTerm package claimed to emulate this rather expensive industry-standard terminal.

Being one of the original users of SuperTerm, I had the privilege of paying full price for it. At $150, it wasn't exactly small change.

The package had a lengthy instruction manual that was very well written. However, due to the complexity of the program, I still had to spend almost two full evenings learning how to work with it.

The SuperTerm package lived up to its promise to emulate the VT-100. The program offers a pseudo 80-column screen that, while still only displaying 40 columns at one time, allows you to scroll from side to side to allow for a full 80 columns. It's a compromise, but it works.

SuperTerm includes a text editor that has enough features to tempt you to use it to write an occasional letter. The program also allows for user-defined ASCII codes, making it adaptable to virtually any environment.

The version of SuperTerm that I have supports Punter protocol and ASCII transfer. It can accommodate neither XModem nor special CompuServe abilities. Newer versions of the program offer XModem and a special SuperTerm proprietary protocol.

The cost for SuperTerm has dropped considerably since the release of the original version, making it a better value for your money. Especially if you are looking for the VT-100 (or VT-52/62/102) emulation capabilities, you may want to consider this program. *(Midwest Micro, PO Box 6148, Kansas City, MO 64110.)*

Sixth Sense

Not satisfied with the versatility of Smart 64, Microtechnic Solutions went back to the drawing board to create a "super" terminal package. Sixth Sense includes all of the features of its older brother, plus a lot more.

Under license from CompuServe, Sixth Sense now includes B protocol; the program also continues to support XModem. A split-screen option (similar to a buffered send) is also included.

A 700-line virtual screen allows you to glance backwards at something that has just scrolled off the screen, without having to leave the main terminal program.

I found the 100-page instruction manual somewhat easier to read than the one included with Smart 64. A few more specific examples might have been helpful, but, all in all, I was able to operate the program almost immediately.

Another added feature is a built-in screen editor that allows you to compose messages and edit received text. A full complement of features is also included, making Sixth Sense one of the most versatile programs available. *(Microtechnic Solutions, PO Box 2940, New Haven, CT 06515.)*

VIP Terminal XL

There's a reason that the star performer always appears last. So it is with VIP Terminal XL, which is the latest version of the program. VIP is like nothing else we've looked at so far.

From the time VIP begins loading, you know something special is about to happen. What you find after the program loads is a piece of software that is designed to make telecommunications as simple as possible.

Perhaps one of the most obvious advantages of VIP Terminal XL is that it supports 40-, 64- and 106-column screens, without requiring additional hardware support. The display may be a bit fuzzy on the Commodore color monitor, but it is still quite readable. A choice of several character styles will also help you overcome the problem.

While it's not VT-52-compatible in the absolute sense, VIP does share some of the control codes with the VT-52, and these codes are well documented. While B protocol is not supported, color graphics are. XModem

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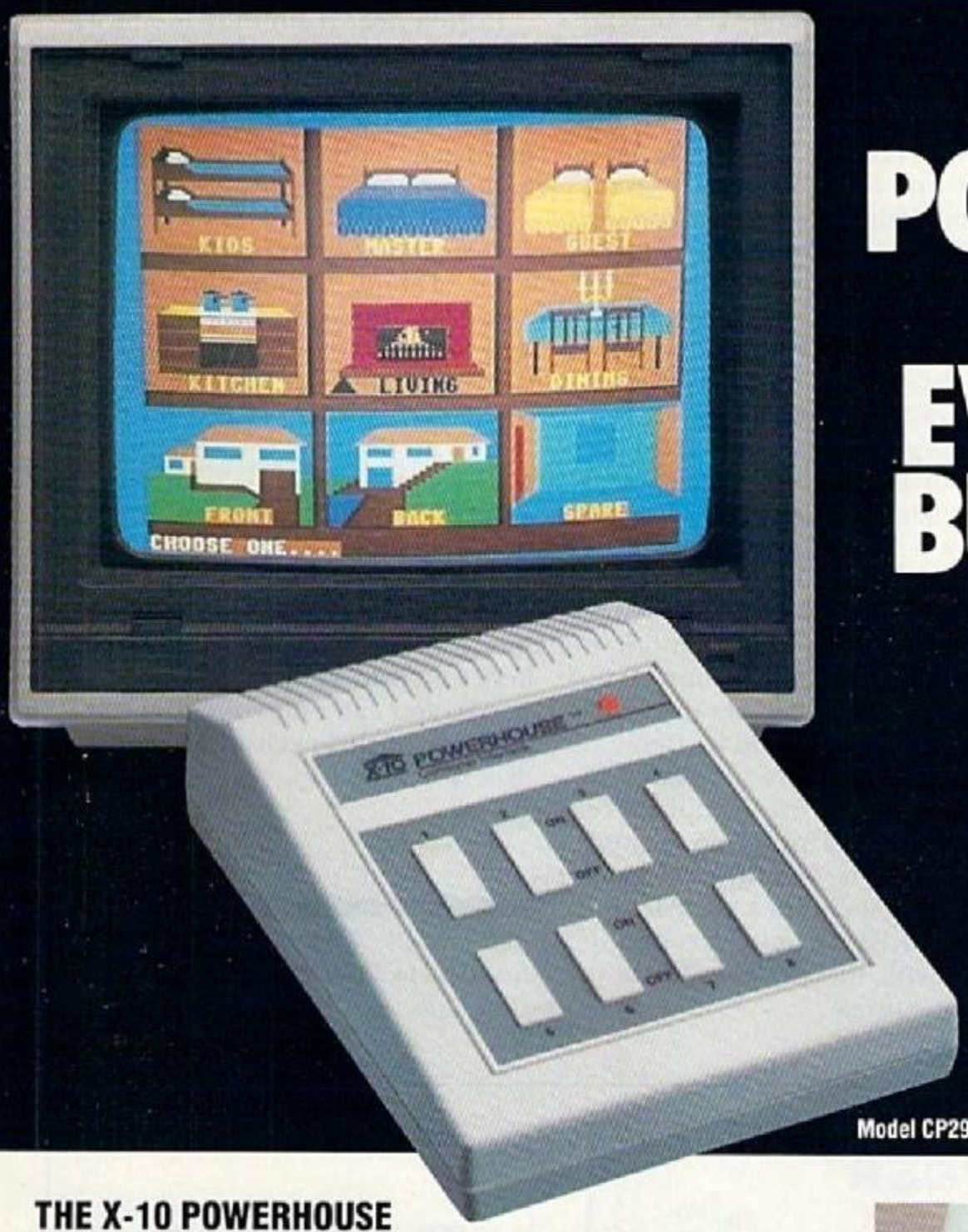

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allows efficient uploading and downloading. (Punter protocol is also supported in the *old* version.)

The manual is 112 pages, written in the clearest and most concise manner of any of the packages examined here. You really have to see VIP to appreciate it.

Really, it's not so much that VIP Terminal XL offers features not available in other packages, it's more the way in which they are implemented that makes the program special. VIP is deserving of its name, and if you plan on doing a lot of telecommunicating, it deserves your serious consideration. *(Softlaw, 9072 Lyndale Ave. South, Minneapolis, MN 55420.)*

Budget Bonanza

Perhaps you want to take advantage of all of the excitement of telecommunications, but are really on a tight budget. There's no reason for you not to become involved, as there are numerous public domain telecommunications programs available for you to use.

I've already mentioned HiggyTerm. Since many of you received that with your modem, I won't go into detail about it here. It is available on the Commodore Information Network (on CompuServe) for both the C-64 and C-128.

There are numerous versions of XModem available for the Commodore machines. A popular public domain version was translated by Karl Schmitt. It's available through many user's groups. Karl's original program is written in Basic and offers only somewhat limited features. It is, however, a good, solid system for the transfer of programs. I often use it for XModem transfers.

There's a deluxe version of XModem that improves almost daily. Once again, you can find it either on the Commodore Information Network or through many local user's groups. It includes many of the features discussed in the programs here, and it's free!

If you are especially interested in the CB simulation on CompuServe, a special terminal program is available that includes a split-screen display and an 80-column screen. It, too, is improved upon quite frequently, so check with the CB people about its latest features.

I often hear from individuals who are not near a local user's group or are unable to travel to meetings. There is an organization that brings many aspects of the local user's group to you, no matter where you live.

The Toronto Pet Users' Group (TPUG) is one of the oldest and largest clubs around. Membership includes access to the group's enormous disk and tape library at a very reasonable copying charge. They have numerous telecommunications programs, so there's no need for you to be without access to software.

Telecommunications is a wonderful thing. It provides the opportunity for people from all around the world to get together and share a common interest. By selecting the software best suited to your communications needs, you can enjoy just as little or as much of this exciting field as you like. Bon appetit! R

Address all author correspondence to Jim Grubbs, PO Box 3042, Springfield, IL 62708.

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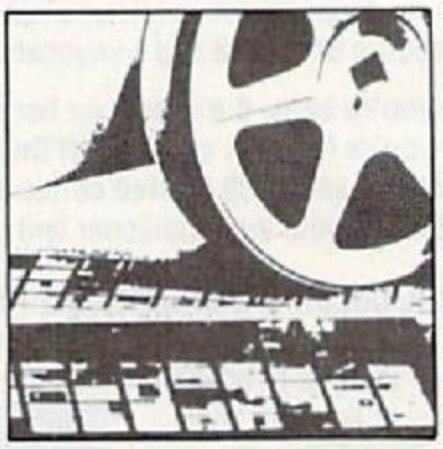

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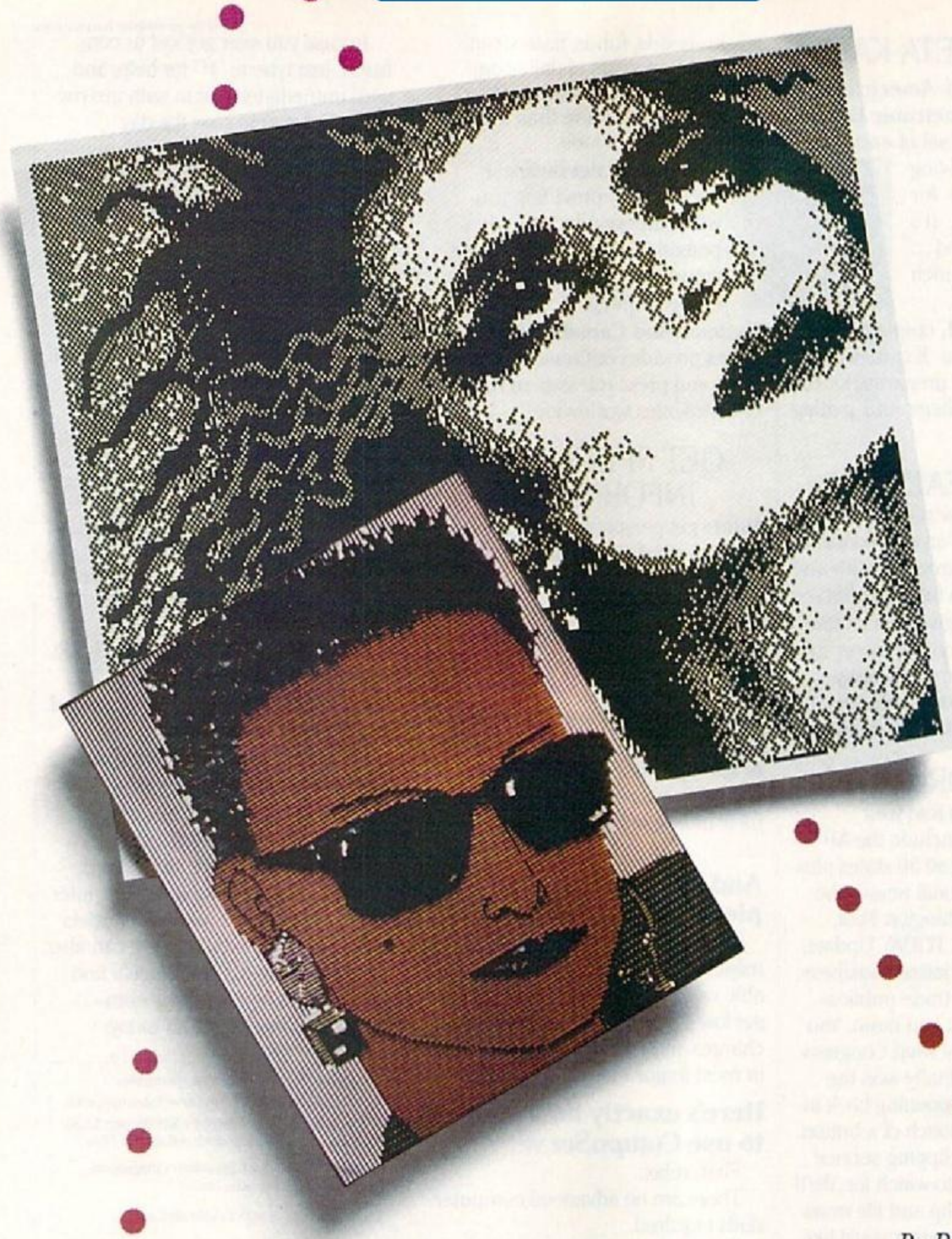

By ROBIN FRANZEL

Now, with only one program, you can print both low- and high-resolution screens. And doing so is as simple as pressing a function key.

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Print Screen Plus

If you've ever worked with either high- or low-resolution graphics, you've probably wished that you had some way to capture that screen image on paper. After all, even the Commodore 1525 printer is capable of producing bit-mapped graphics of surprisingly good quality.

The accompanying program, Print Screen Plus (Listing 1), will dump a text screen to any printer and a high- or low-resolution graphics screen to your dot-matrix printer. You only have to press a function key, and the program will determine whether you're in high or low resolution and print accordingly.

It will also load a previously saved hi-res screen, whether that screen was saved as a sequential file, a straight program file or a Koala file. You needn't concern yourself with what type of file you're loading. Just enter the filename, and the Print Screen Plus program will figure out what you're talking about and load it.

You can also save a hi-res screen to disk by just pressing a function key and entering the filename.

If you're in lo-res and have a hi-res screen loaded, you can view your hi-res screen by pressing another key. While in the view screen, f1 will print the hi-res screen, and the space bar will return you to your prior screen.

Printing Your Screen

To use Print Screen Plus, type in and save Listing 1, then run it. If you have a 1525 printer, you're all set to use the program as described below. The new interrupt routine will now be enabled.

If you have a non-Commodore printer, then, after you have typed in and run Listing 1 (this will enable the new interrupt routine), type in and run Listing 2. This program will modify the main program to work with a Gemini 10X printer with a Cardco ?/+G interface. It is easily modifiable to work with virtually any dot-matrix printer and will enable you to take full advantage of your non-Commodore printer's capabilities.

Listing 3 is provided for your convenience. It will save the machine language program to disk with the name HIRESUTIL, which will enable you to start up the program by entering:

```
LOAD "HIRESUTIL",8,1
```

and then

```
SYS49152
```

This will load the program much faster and, for non-Commodore printer users, will make it unnecessary to load and run two programs.

To use the program, load and run Listing 1 and, if necessary, Listing 2. Make modifications to the program, if desired, as described below, and then load and run Listing 3. You'll be asked to insert a disk and press a key when ready. When you press a key, the Print Screen Plus program will be saved on your disk.

Listings 1 and 2 are provided with a checksum routine. The last number on each line is the sum of the other numbers on the line. If you make a typing error while entering the programs, you will be told in which line you made an error. Check that line carefully. If it looks okay, then you have probably entered an extra number or comma on the end of the previous line.

How It Works

The program is interrupt-driven, which means that it can work even while you have another program running (as long as there isn't a conflict for memory use). Sixty times a second, location 197 ($C5) in the C-64 is checked for a depressed key. If one of the function keys is pressed, then the Print Screen Plus program takes over and does its work. When it is finished, it returns you to where you left off in your program. You can change the keys that do the work, but the program defaults are as follows:

f1 Checks to see if you are in High-Resolution or Low-Resolution mode and prints the screen.

f3 Prompts you for a hi-res filename and then loads a file. Pressing the return key without a filename will return you to your processing.

f5 Prompts you for a filename, and then saves the hi-res screen. Pressing the return key without a filename will return you to your processing.

f7 Turns on Hi-Res mode for viewing a screen in memory. Press the f1

RUN It Right

C-64; C-128 (in C-64 mode)
Disk drive; printer

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key to print the screen or the space bar to return to your processing.

To change the keys that perform these functions, simply update a four-character table in the program with the key code for the new key. A chart of these key codes can be found in *RUN*'s Special Issue on p. 146. To disable a function, Poke the table with a 0. The program table is in location 49283 ($C083) and is in Print, Load, Save and View sequence.

For example, to change the program so that the £ key initiates the save function, enter:

```
POKE 49285,48
```

Location 49300 ($C094) contains the secondary address when opening the printer. You need to Poke this location if you want to change from uppercase/graphics to lowercase/business mode when printing a low-resolution screen. The default is uppercase. To change to lowercase, enter:

```
POKE 49300,7
```

To change back to uppercase, enter:

```
POKE 49300,0
```

It's very easy to use the Print Screen Plus program from Basic in Direct mode or from your Basic program. A jump table has been provided for easy access to the main routines. Just type SYS, followed by the memory location specified in the first column below, and the function to the right will be activated.

49152 ($C000) Turns on the interrupt routine
49155 ($C003) Turns off the interrupt routine
49158 ($C006) Prints lo- or hi-res screen (whichever is on screen)
49161 ($C009) Prints lo-res screen
49164 ($C00C) Prints hi-res screen
49167 ($C00F) Loads file
49170 ($C012) Saves file
49173 ($C015) Turns on Bit-mapped mode
49176 ($C018) Turns off Bit-mapped mode

Why do you need to use Listing 2 for non-Commodore printers? One reason is speed. With only Listing 1, dumping a hi-res screen to the Commodore 1525 printer takes a respectable four minutes and 12 seconds.

With Listing 2, my Gemini printer will print a hi-res screen in 35 seconds! The program routine provided by Listing 2 enables you to bypass the interface and send control and data codes directly to the printer. The control codes are sent to the printer at the beginning of every hi-res line. The codes provided with the program are as follows:

```
CHR$(27)CHR$(64)
```

to initialize the printer;

```
CHR$(27)CHR$(51)CHR$(16)
```

for nine lines/inch; and

```
CHR$(27)CHR$(75)CHR$(64)CHR$(1)
```

to set to Bit-mapped mode, 320 bits per line.

The first two CHR$ codes are unnecessary, but I wanted to allow for as many codes as you might need for any printer. To make it work with your printer, check your printer's manual to see what codes put you in Graphics mode. Then, starting at location 50867 ($C6B3), Poke those codes into the program. Next, Poke the number of codes you entered into location 49595 ($C1BB), so that the program knows where to start putting the hi-res data. If you update and save the program with Listing 3, you won't have to Poke in those codes every time you use the program.

Screen Locations

	X→ 0------7	8------15	.....	312------319
Y				
↓				
0	Byte 0	Byte 8		Byte 312
1	Byte 1	Byte 9		Byte 313
:				
:				
7	Byte 7	Byte 15		Byte 319
8	Byte 320	Byte 328		
9	Byte 321	Byte 329		
:				
:				
15	Byte 327			
16				
:				
:				
199				

Table 1. *Bit-map layout.*

High Resolution vs. Low Resolution

There are two kinds of high-resolution screens on the C-64: Bit-mapped mode and Multicolor Bit-mapped mode. Print Screen Plus will print either mode, but occasionally your multicolor graphics screen won't look exactly the same as when it was created. (To see exactly what your printout will look like, press f7, the View option.) To understand why this is so, let's take a look at how high resolution is accomplished.

Here is the reason your screen display will differ from your printout. In Low-resolution mode, characters are Poked into an area of memory called the screen map (this is usually in location 1024 or $0400) by a one-byte code. Even though characters appear on the screen as a group of little dots, or pixels (in fact, each character occupies a cell eight pixels high and eight pixels wide), it only takes one byte to identify it. Therefore, since there are 40 columns and 25 lines on the screen, the lo-res screen map only has to be 1000 bytes (40 × 25).

Bit-mapped graphics requires a new screen map that is 8000 bytes long. Each character location, or cell, is made up of eight bytes, and each bit in the map corresponds to a single pixel on the screen. Hence, the term "bit-mapped."

See Table 1 for a layout of the bit map.

Some examples should make this layout easy to follow. If X (0–319) represents the horizontal pixels and Y (0–199) represents the vertical pixels, a pixel is referenced by its (X,Y) coordinates. To turn on pixel (4,5), the fifth bit in the sixth byte should be set to 1. To turn on pixel (7,7), the last bit in byte 7 should be set to 1. However, to turn on the bit just to the right of it (8,7), the first bit in byte 15 should be set to 1.

Bit-map cells control the color. Print Screen Plus recognizes only color 0 (white) and color 1 (dark gray). If a bit within a cell is turned off (0), the computer recognizes that color to be white. If the color is set to 1, it is recognized as dark gray.

Four colors are available in Multicolor Bit-mapped mode. Two bits are required to select one color. In

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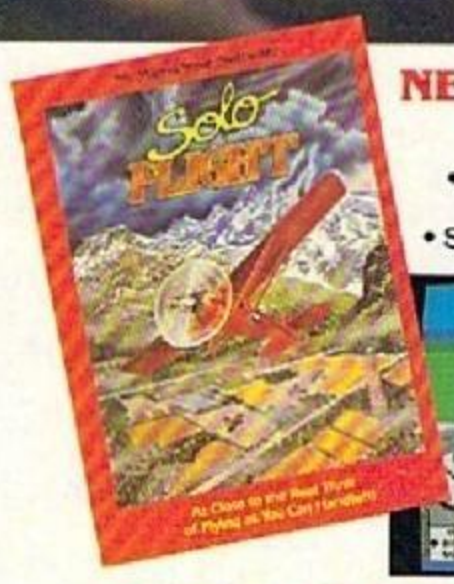

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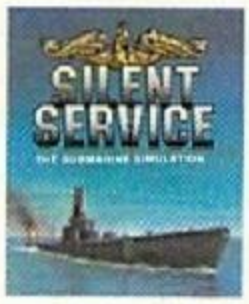

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this mode, every two bits corresponds to two pixels on the screen. Those two bits must share the same color, thus reducing the High-resolution mode by half. For example, the byte 00 01 10 11 in Bit-mapped mode will turn on to color 1 bits 3, 4, 6 and 7, and to color 0 bits 0, 1, 2 and 5. In Multicolor Bit-mapped mode, the same byte will turn on to color 0 bits 0 and 1 and to color 1 bits 2 and 3. To color 2, it will turn on bits 4 and 5 and to color 3, bits 6 and 7.

Print Screen Plus recognizes the hi-res screen as a bit-map screen, which is nice, even in Multicolor mode, because each of the four colors will be given a different shading. To see how your picture will appear on the screen, use the View option.

If you do not wish to type in the program listings, just send me a disk in a self-addressed stamped mailer, along with $5, and I will send you all three programs.

Note: C-64 Screen Print Plus will work with many of *RUN*'s previously published hi-res drawing programs. "Joystick Artist" (June 1984) is one such program. Also, this screen print program will work with "High Performance Turtle" (July 1985) and "Graphics Display System" (October 1985).

Enjoy the exciting world of C-64 graphics and Print Screen Plus! R

Address all author correspondence to Robin Franzel, 5521 Harvey Lane, Alexandria, VA 22312.

Listing 1. *Print Screen Plus program.*

```
10 DATA76,27,192,76,57,192,76,170,192,76,18
   0,192,1506                              :REM*192
20 DATA76,28,193,76,139,195,76,187,194,76,1
   33,194,1567                             :REM*122
30 DATA76,155,194,120,173,20,3,141,101,198,
   173,21,1375                             :REM*78
40 DATA3,141,102,198,169,74,141,20,3,169,19
   2,141,1353                              :REM*6
50 DATA21,3,169,0,141,100,198,88,96,120,173
   ,101,1210                               :REM*46
60 DATA198,240,9,141,20,3,173,102,198,141,2
   1,3,1249                                :REM*98
70 DATA88,96,173,100,198,208,12,160,3,165,1
   97,217,1617                             :REM*90
80 DATA131,192,240,6,136,16,248,108,101,198
   ,152,10,1538                            :REM*2
90 DATA168,185,135,192,141,118,192,185,136,
   192,141,119,1904                        :REM*130
100 DATA192,169,255,141,100,198,32,192,197,
   32,170,192,1870                         :REM*102
110 DATA32,165,197,169,0,141,100,198,108,10
   1,198,4,1413                            :REM*104
120 DATA5,6,3,170,192,139,195,187,194,140,1
   97,169,1597                             :REM*242
130 DATA4,162,4,160,0,32,186,255,169,0,32,1
   89,1193                                 :REM*114
140 DATA255,32,192,255,144,3,104,104,96,162
   ,4,76,1427                              :REM*156
150 DATA201,255,173,17,208,41,32,240,3,76,2
   8,193,1467                              :REM*204
160 DATA32,143,192,169,0,133,251,173,136,2,
   133,252,1616                            :REM*66
170 DATA162,25,160,0,177,251,32,244,192,200
   ,192,40,1675                            :REM*38
180 DATA208,246,169,13,32,210,255,169,40,24
   ,101,251,1718                           :REM*118
190 DATA133,251,144,2,230,252,160,0,202,208
   ,225,169,1976                           :REM*138
200 DATA13,32,210,255,32,210,255,32,204,255
   ,169,4,1671                             :REM*22
210 DATA32,195,255,96,8,41,127,201,64,144,2
   ,9,1174                                 :REM*90
220 DATA128,201,32,176,2,105,64,201,34,208,
   2,169,1322                              :REM*160
230 DATA39,40,16,12,72,169,18,32,210,255,10
   4,32,999                                :REM*32
240 DATA210,255,169,146,32,210,255,96,32,14
   3,192,32,1772                           :REM*98
250 DATA233,193,169,8,141,179,198,169,199,1
   41,62,3,1695                            :REM*56
260 DATA72,169,180,133,251,169,198,133,252,
   169,0,141,1867                          :REM*107
270 DATA60,3,141,61,3,104,141,62,3,72,160,1
   ,811                                    :REM*153
280 DATA140,105,198,136,169,128,145,251,32,
   16,194,160,1674                         :REM*163
290 DATA0,177,253,45,64,3,240,7,177,251,13,
   105,1335                                :REM*207
300 DATA198,145,251,206,62,3,173,105,198,10
   ,141,105,1597                           :REM*161
310 DATA198,201,128,208,223,230,251,208,2,2
   30,252,238,2369                         :REM*13
320 DATA60,3,208,3,238,61,3,173,60,3,201,64
   ,1077                                   :REM*11
330 DATA173,61,3,233,1,208,182,104,56,233,7
   ,144,1405                               :REM*3
340 DATA7,72,32,196,193,76,45,193,160,0,185
   ,180,1339                               :REM*187
350 DATA198,41,143,153,180,198,200,208,245,
   160,64,185,1975                         :REM*35
360 DATA180,199,41,143,153,180,199,136,16,2
   45,32,196,1720                          :REM*153
370 DATA193,160,4,185,93,198,32,210,255,136
   ,16,247,1729                            :REM*93
380 DATA32,204,255,169,4,76,195,255,169,179
   ,133,251,1922                           :REM*91
390 DATA169,198,133,252,160,0,177,251,32,21
   0,255,200,2037                          :REM*197
400 DATA208,248,230,252,162,65,177,251,32,2
   10,255,200,2290                         :REM*47
410 DATA202,208,247,169,13,32,210,255,96,17
   3,17,208,1830                           :REM*71
420 DATA41,32,240,22,173,0,221,41,3,168,185
   ,12,1138                                :REM*209
430 DATA194,141,99,198,173,24,208,41,8,240,
   8,173,1507                              :REM*25
440 DATA99,198,9,32,141,99,198,96,192,128,6
   4,0,1256                                :REM*203
450 DATA169,0,133,254,56,169,199,237,62,3,7
   2,41,1395                               :REM*125
460 DATA248,10,38,254,10,38,254,10,38,254,7
   2,141,1367                              :REM*243
470 DATA65,3,165,254,141,66,3,104,10,38,254
   ,10,1113                                :REM*83
480 DATA38,254,109,65,3,133,253,165,254,109
   ,66,3,1452                              :REM*73
490 DATA133,254,173,60,3,41,248,101,253,133
   ,253,173,1825                           :REM*235
500 DATA61,3,101,254,133,254,104,41,7,101,2
   53,133,1445                             :REM*99
510 DATA253,165,254,109,99,198,133,254,173,
   60,3,41,1742                            :REM*177
520 DATA7,170,189,179,194,141,64,3,96,169,1
   77,160,1549                             :REM*174
530 DATA0,174,136,2,132,251,134,252,162,4,1
   45,251,1643                             :REM*110
540 DATA200,208,251,230,252,202,208,246,96,
   120,173,17,2203                         :REM*46
550 DATA208,9,32,141,17,208,173,24,208,9,8,
   141,1178                                :REM*174
560 DATA24,208,32,109,194,88,96,120,173,17,
   208,41,1310                             :REM*74
570 DATA223,141,17,208,173,24,208,41,247,14
   1,24,208,1655                           :REM*118
```

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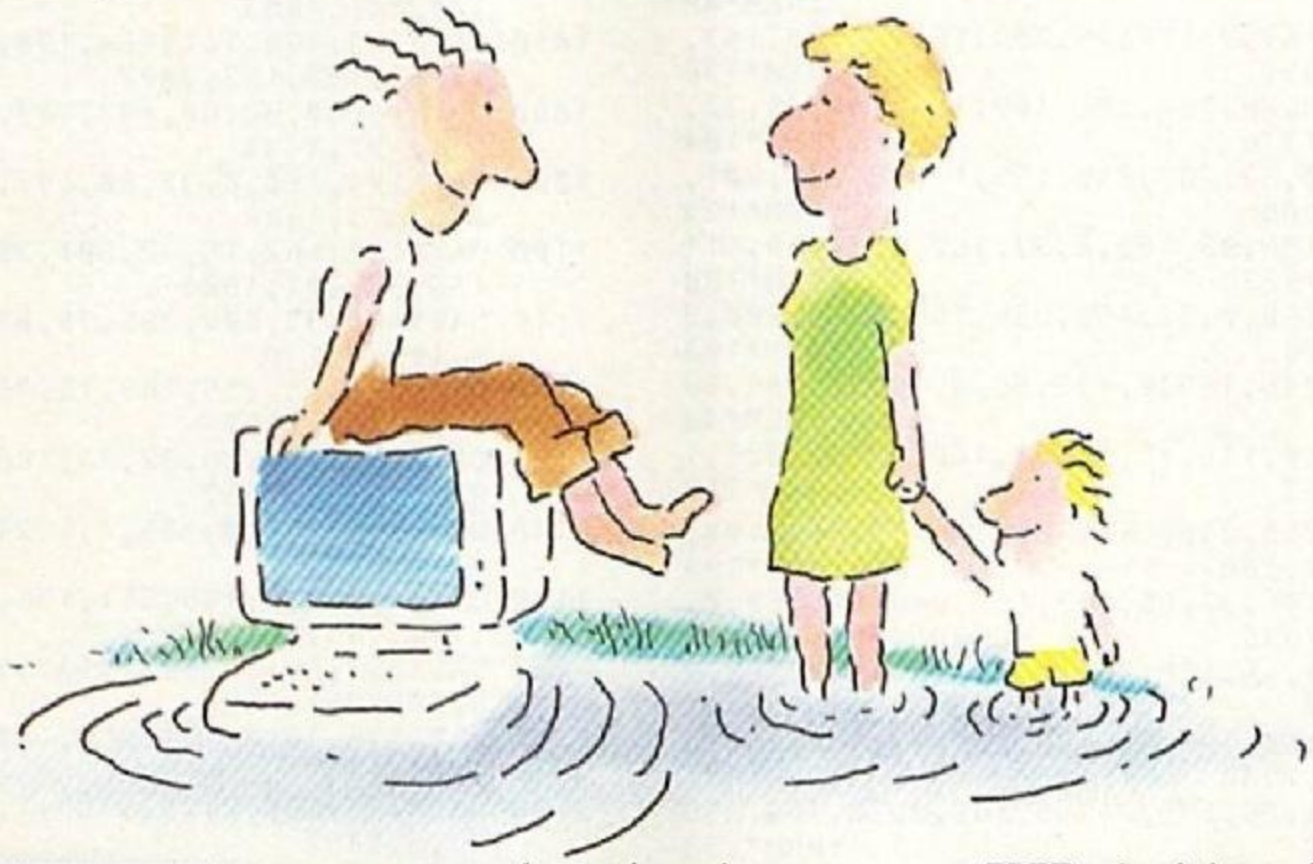

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Listing 1 continued.

```
58Ø DATA169,32,32,111,194,88,96,128,64,32,1
    6,8,97Ø                                  :REM*162
59Ø DATA4,2,1,32,233,193,173,17,2Ø8,72,173,
    24,1132                                  :REM*144
6ØØ DATA2Ø8,72,32,155,194,169,21,141,24,2Ø8
    ,169,198,1591                            :REM*88
61Ø DATA16Ø,33,32,227,196,32,65,195,169,Ø,1
    53,177,1439                              :REM*1ØØ
62Ø DATA2,152,17Ø,16Ø,Ø,185,177,2,24Ø,47,2Ø
    Ø,2Ø1,1536                               :REM*25Ø
63Ø DATA32,24Ø,246,138,162,177,16Ø,2,32,189
    ,255,32,1665                             :REM*6Ø
64Ø DATA57,195,32,35,195,169,Ø,133,251,173,
    99,198,1537                              :REM*9Ø
65Ø DATA133,252,173,99,198,9,31,168,162,64,
    169,251,17Ø9                             :REM*254
66Ø DATA32,216,255,32,46,195,32,87,195,12Ø,
    1Ø4,141,1455                             :REM*138
67Ø DATA24,2Ø8,1Ø4,141,17,2Ø8,32,1Ø9,194,88
    ,96,162,1383                             :REM*98
68Ø DATA9,181,45,157,167,2,2Ø2,16,248,96,16
    2,9,1294                                 :REM*42
69Ø DATA189,167,2,149,45,2Ø2,16,248,96,169,
    14,162,1459                              :REM*196
7ØØ DATA8,168,76,186,255,169,198,16Ø,61,32,
    227,196,1736                             :REM*1Ø4
71Ø DATA16Ø,Ø,32,2Ø7,255,153,177,2,2ØØ,2Ø1,
    13,2Ø8,16Ø8                              :REM*124
72Ø DATA245,136,96,169,8,32,18Ø,255,169,111
    ,32,15Ø,1583                             :REM*158
73Ø DATA255,16Ø,Ø,32,165,255,153,69,3,2ØØ,2
    Ø1,13,15Ø6                               :REM*198
74Ø DATA2Ø8,245,169,Ø,153,69,3,16Ø,Ø,185,69
    ,3,1264                                  :REM*44
75Ø DATA2Ø1,5Ø,144,12,169,3,16Ø,69,32,227,1
    96,32,1295                               :REM*212
76Ø DATA228,255,24Ø,251,76,171,255,169,198,
    16Ø,47,32,2Ø82                           :REM*194
77Ø DATA227,196,32,65,195,152,24Ø,3Ø,169,Ø,
    153,177,1636                             :REM*13
78Ø DATA2,169,15,168,162,8,32,186,255,169,2
    ,162,133Ø                                :REM*161
79Ø DATA153,16Ø,198,32,189,255,32,192,255,3
    2,87,195,178Ø                            :REM*171
8ØØ DATA144,1,96,169,2,168,162,8,32,186,255
    ,169,1392                                :REM*233
81Ø DATA1,162,155,16Ø,198,32,189,255,32,192
    ,255,32,1663                             :REM*1Ø9
82Ø DATA87,195,144,1,96,169,18,16Ø,1,32,244
    ,196,1343                                :REM*185
83Ø DATA144,3,76,47,197,162,2,32,198,255,32
    ,2Ø7,1355                                :REM*43
84Ø DATA255,141,67,3,32,2Ø7,255,141,68,3,16
    9,188,1529                               :REM*117
85Ø DATA133,251,169,198,133,252,169,8,133,2
    53,16Ø,Ø,1859                            :REM*153
86Ø DATA32,2Ø7,255,145,251,2ØØ,192,254,2Ø8,
    246,32,2Ø4,2226                          :REM*169
87Ø DATA255,16Ø,Ø,177,251,2Ø1,129,24Ø,45,2Ø
    1,13Ø,24Ø,2Ø29                           :REM*169
88Ø DATA41,24,169,32,1Ø1,251,133,251,165,25
    2,1Ø5,Ø,1524                             :REM*69
89Ø DATA133,252,198,253,2Ø8,227,172,68,3,17
    3,67,3,1757                              :REM*71
9ØØ DATA2Ø8,167,169,198,16Ø,16,32,227,196,3
    2,47,197,1649                            :REM*93
91Ø DATA32,228,255,24Ø,251,96,141,132,198,1
    6Ø,18,162,1913                           :REM*2Ø7
92Ø DATA15,177,251,157,133,198,136,2Ø2,16,2
    47,232,16Ø,1924                          :REM*249
93Ø DATAØ,185,133,198,2Ø1,129,2Ø8,1,2ØØ,189
    ,177,2,1623                              :REM*219
94Ø DATA24Ø,13,217,133,198,2Ø8,178,232,2ØØ,
    192,15,2Ø8,2Ø34                          :REM*157
95Ø DATA24Ø,24Ø,12,185,133,198,41,95,2Ø8,16
    3,2ØØ,192,19Ø7                           :REM*175
96Ø DATA15,2Ø8,244,32,47,197,173,132,198,16
    Ø,8Ø,2Ø1,1687                            :REM*1Ø7
97Ø DATA13Ø,24Ø,2,16Ø,83,14Ø,15Ø,198,32,57,
    195,169,1556                             :REM*71
98Ø DATA2Ø,162,133,16Ø,198,32,189,255,32,19
    2,255,32,166Ø                            :REM*141
99Ø DATA2Ø4,255,169,198,16Ø,8Ø,32,227,196,1
    62,14,32,1729                            :REM*217
1ØØØ DATA198,255,169,32,133,252,169,Ø,133,2
    51,168,162,1922                          :REM*161
1Ø1Ø DATA31,134,253,173,132,198,2Ø1,13Ø,2Ø8
    ,6,32,2Ø7,17Ø5                           :REM*231
1Ø2Ø DATA255,32,2Ø7,255,32,2Ø7,255,145,251,
    2ØØ,2Ø8,248,2295                         :REM*65
1Ø3Ø DATA23Ø,252,198,253,2Ø8,242,32,2Ø7,255
    ,145,251,2ØØ,2473                        :REM*44
1Ø4Ø DATA192,64,2Ø8,246,32,2Ø4,255,169,14,3
    2,195,255,1866                           :REM*76
1Ø5Ø DATA76,14Ø,197,132,251,133,252,16Ø,Ø,1
    77,251,24Ø,2ØØ9                          :REM*234
1Ø6Ø DATA6,32,21Ø,255,2ØØ,2Ø8,246,96,72,169
    ,48,141,1683                             :REM*96
1Ø7Ø DATA163,198,141,164,198,141,166,198,14
    1,167,198,152,2Ø27                       :REM*228
1Ø8Ø DATA16Ø,Ø,32,6Ø,197,169,198,16Ø,166,32
    ,73,197,1444                             :REM*158
1Ø9Ø DATA1Ø4,16Ø,Ø,32,6Ø,197,169,198,16Ø,16
    3,32,73,1348                             :REM*244
11ØØ DATA197,162,15,32,2Ø1,255,169,198,16Ø,
    156,32,227,18Ø4                          :REM*46
111Ø DATA196,32,2Ø4,255,76,87,195,32,2Ø4,25
    5,169,2,17Ø7                             :REM*98
112Ø DATA32,195,255,169,15,76,195,255,133,9
    9,132,98,1654                            :REM*124
113Ø DATA162,144,56,32,73,188,76,221,189,13
    2,251,133,1657                           :REM*6
114Ø DATA252,16Ø,Ø,185,1,1,24Ø,13,72,2ØØ,18
    5,1,131Ø                                 :REM*192
115Ø DATA1,24Ø,7,145,251,136,1Ø4,145,251,96
    ,1Ø4,145,1625                            :REM*174
116Ø DATA251,96,132,251,133,252,16Ø,2,169,4
    8,145,251,189Ø                           :REM*58
117Ø DATA136,16,251,162,Ø,189,1,1,24Ø,3,232
    ,2Ø8,1439                                :REM*4
118Ø DATA248,16Ø,2,2Ø2,189,1,1,145,251,2Ø2,
    48,3,1452                                :REM*2Ø2
119Ø DATA136,16,245,96,32,133,194,165,197,2
    Ø1,6Ø,24Ø,1715                           :REM*234
12ØØ DATA8,2Ø5,131,192,2Ø8,245,32,17Ø,192,3
    2,155,194,1764                           :REM*248
121Ø DATA169,Ø,133,198,96,16Ø,25,185,1Ø6,19
    8,153,217,164Ø                           :REM*18Ø
122Ø DATAØ,136,16,247,24,174,1Ø3,198,172,1Ø
    4,198,32,14Ø4                            :REM*16Ø
123Ø DATA24Ø,255,169,253,16Ø,251,2Ø8,25,16Ø
    ,25,185,217,2148                         :REM*22
124Ø DATAØ,153,1Ø6,198,136,16,247,56,32,24Ø
    ,255,142,1581                            :REM*128
125Ø DATA1Ø3,198,14Ø,1Ø4,198,169,251,16Ø,25
    3,14Ø,2,198,1916                         :REM*54
126Ø DATA141,4,198,169,Ø,133,253,173,136,2,
    133,254,1596                             :REM*118
127Ø DATA169,188,133,251,169,198,133,252,24
    ,169,64,1Ø1,1851                         :REM*22Ø
128Ø DATA251,133,251,169,1,1Ø1,252,133,252,
    162,4,16Ø,1869                           :REM*89
129Ø DATAØ,177,253,145,251,136,2Ø8,249,23Ø,
    254,23Ø,252,2385                         :REM*15
13ØØ DATA2Ø2,2Ø8,242,96,13,7Ø,73,76,69,32,7
    8,79,1238                                :REM*19
131Ø DATA84,32,7Ø,79,85,78,68,13,Ø,147,83,6
    7,8Ø6                                    :REM*47
132Ø DATA82,69,69,78,32,83,65,86,69,13,Ø,14
    7,793                                    :REM*255
133Ø DATA83,67,82,69,69,78,32,76,79,65,68,1
    3,781                                    :REM*69
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Listing 1 continued.

```
134Ø DATAØ,13,69,78,84,69,82,32,7Ø,73,76,69
     ,715                                  :REM*91
135Ø DATA78,65,77,69,58,32,32,Ø,13,76,79,65
     ,644                                  :REM*251
136Ø DATA68,73,78,71,46,46,46,13,Ø,13,13,13
     ,48Ø                                  :REM*153
137Ø DATA15,13,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,28
                                           :REM*223
138Ø DATAØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø  :REM*247
139Ø DATAØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø    :REM*1
14ØØ DATAØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø   :REM*11
141Ø DATAØ,Ø,Ø,Ø,Ø,44,8Ø,44,82,73,48,35,4Ø6
                                           :REM*7
142Ø DATA85,49,32,5Ø,32,48,32,49,5Ø,32,48,4
     8,555                                 :REM*95
143Ø DATAØ,66,45,8Ø,32,5Ø,32,48,48,49,Ø,27,
     477                                   :REM*185
144Ø DATA64,27,51,16,27,75,64,1,Ø,Ø,Ø,Ø,325
                                           :REM*1Ø3
2ØØØ SA=49152:BE=SA:L=1Ø:NL=144             :REM*43
2Ø1Ø PRINT"LOADING...":PRINT               :REM*215
2Ø2Ø FORI=1TONL:CS=Ø                       :REM*121
2Ø3Ø FORJ=ØTO11:READK:IFK>255THEN21ØØ
                                           :REM*59
2Ø4Ø POKESA+J,K:CS=CS+K:NEXT               :REM*249
2Ø5Ø READLT:IFLT<>CSTHEN21ØØ               :REM*154
2Ø6Ø SA=SA+12:L=L+1Ø:NEXT                   :REM*46
2Ø7Ø PRINTCHR$(17)SPC(6)"COMMODORE 64 HIRES
      UTILITY"                             :REM*136
2Ø8Ø PRINTCHR$(17)SPC(12)"BY ROBIN FRANZEL"
                                           :REM*34
2Ø9Ø SYSBE:NEW                              :REM*2
21ØØ PRINT"ERROR IN DATA STATEMENT #";L
                                           :REM*1ØØ
```

Listing 2. *Gemini 10X conversion program.*

```
1Ø DATA173,148,192,72,169,4,141,148,192,32,
   143,192,16Ø6                            :REM*232
2Ø DATA1Ø4,141,148,192,32,233,193,24,169,64
   ,1Ø9,187,1596                           :REM*178
3Ø DATA193,141,217,193,169,Ø,133,253,173,99
   ,198,133,19Ø2                           :REM*194
4Ø DATA254,169,198,133,252,169,179,133,251,
   24,173,187,2122                         :REM*152
5Ø DATA193,1Ø1,251,133,251,169,25,141,184,1
   93,169,4Ø,185Ø                          :REM*158
6Ø DATA141,186,193,16Ø,7,177,253,153,188,19
   3,136,16,18Ø3                           :REM*18
7Ø DATA248,16Ø,8,14Ø,185,193,169,Ø,162,Ø,1Ø
   ,3Ø,13Ø5                                :REM*156
8Ø DATA188,193,1Ø5,Ø,232,224,8,2Ø8,245,16Ø,
   Ø,145,17Ø8                              :REM*224
9Ø DATA251,23Ø,251,2Ø8,2,23Ø,252,2Ø6,185,19
   3,2Ø8,226,2442                          :REM*212
1ØØ DATA24,165,253,1Ø5,8,133,253,144,2,23Ø,
   254,2Ø6,1777                            :REM*242
11Ø DATA186,193,2Ø8,195,32,196,193,169,198,
   133,252,169,2124                        :REM*242
12Ø DATA179,133,251,24,173,187,193,1Ø1,251,
   133,251,2Ø6,2Ø82                        :REM*142
13Ø DATA184,193,2Ø8,166,32,2Ø4,255,169,4,76
   ,195,255,1941                           :REM*96
14Ø DATAØ,Ø,Ø,9,Ø,Ø,Ø,Ø,Ø,Ø,Ø,255,264
                                           :REM*44
2ØØ SA=49436:BE=SA:L=1Ø:NL=14               :REM*2
21Ø PRINT"LOADING...":PRINT               :REM*2ØØ
22Ø FORI=1TONL:CS=Ø                       :REM*1Ø6
23Ø FORJ=ØTO11:READK:IFK>255THEN3ØØ        :REM*4
24Ø POKESA+J,K:CS=CS+K:NEXT               :REM*234
25Ø READLT:IFLT<>CSTHEN3ØØ                :REM*234
26Ø SA=SA+12:L=L+1Ø:NEXT                   :REM*31
27Ø PRINTCHR$(17)SPC(6)"HIRES SPECIAL PRINT
   ER ROUTINE"                             :REM*43
28Ø PRINTCHR$(17)SPC(15)"INSTALLED"       :REM*69
29Ø NEW                                   :REM*173
3ØØ PRINT"ERROR IN DATA STATEMENT #";L
                                           :REM*85
```

Listing 3. *Machine language conversion for Print Screen Plus program.*

```
1Ø DATA 169,9,162,93,16Ø,3,32,189,255,169
                                           :REM*82
2Ø DATA 8,168,17Ø,32,186,255,169,192,133,25
   2                                       :REM*2Ø
3Ø DATA 169,Ø,133,251,162,188,16Ø,198,169,2
   51                                      :REM*17Ø
4Ø DATA 76,216,255,72,73,82,69,83,85,84,73,
   76                                      :REM*98
5Ø FORI=828TO869:READA:POKEI,A:NEXT:REM*238
6Ø PRINT"PLACE DISK TO SAVE HIRES IN DRIVE.
                                           :REM*84
7Ø PRINT"{3 SPACEs}PRESS ANY KEY WHEN READY
   .                                       :REM*1ØØ
8Ø GETA$:IFA$=""THEN8Ø                    :REM*158
9Ø SYS828:NEW                             :REM*162
```

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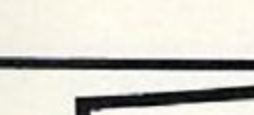

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Sprite Control In C-128 Mode

A discussion of Basic 7.0's sprite commands and functions and a demonstration of their impressive capabilities.

By LOUIS R. WALLACE and DAVID P. DARUS

The Commodore 128 has perhaps the most powerful Basic language ever supplied with a microcomputer—Basic 7.0. The language comes equipped with a large assortment of commands, including many for sprite graphics, thus simplifying sprite creation and movement.

The C-128 has eight sprites, or movable object blocks, just like the C-64. Each can be defined as high resolution or multicolor. However, unlike the C-64, there are high-level commands and functions that let you express your creativity without the hassle of using Pokes or calculating bytes.

There are a total of ten separate commands and functions that control sprites. In addition, there are other commands you can use to enhance your sprite programs.

Making Sprites

For starters, the C-128 comes equipped with a resident sprite editor. This allows you to make high-resolution and multicolor sprites from Direct mode. Simply type SPRDEF, and you'll be whisked away to the sprite editor and asked for a sprite number. This is the number of the sprite you wish to design (1–8).

Once you choose the sprite number, the sprite grid is activated. The dimensions of the grid are 24 × 21 for high resolution and 12 × 21 for multicolor. To design a multicolor sprite, press M; the grid toggles to 12 × 21 pixels. Press M again, and the grid reverts to high resolution. You can move around the grid with the cursor keys, clear the sprite with the CLR key and change colors with the CTRL and CBM keys.

To select colors for your sprite, press numbers 1–4. 1 is background; 2 is foreground; 3 is multicolor 1; 4 is multicolor 2. Once you've finished making the sprite, simultaneously press the shift and return keys and the sprite will be stored in memory, ready for use. You can then enter another sprite number if you want to make another sprite, or press the return key to return to the normal C-128 mode.

To use the sprite in your program, you begin by defining its characteristics (i.e., color, priority and expansion). To handle that, Basic 7.0 provides the Sprite command, which has seven parameters: sp#, on/off, color, priority, x-expansion, y-expansion and mode. You can accomplish with one command what would normally have required six statements and, therefore, more programming time and computer memory and slower program-execution speed.

For example, look at the statement

```
SPRITE 1,1,6,1,1,0,1
```

The first and second "1" take sprite 1 and turn it on (1 is on , 0 off); the "6" makes it green (colors 1–16); the next "1" makes it appear in front of screen data (priority 0 = behind, 1 = in front); the following "1" expands it in the x direction (1 = expanded, 0 = normal); the 0 prevents

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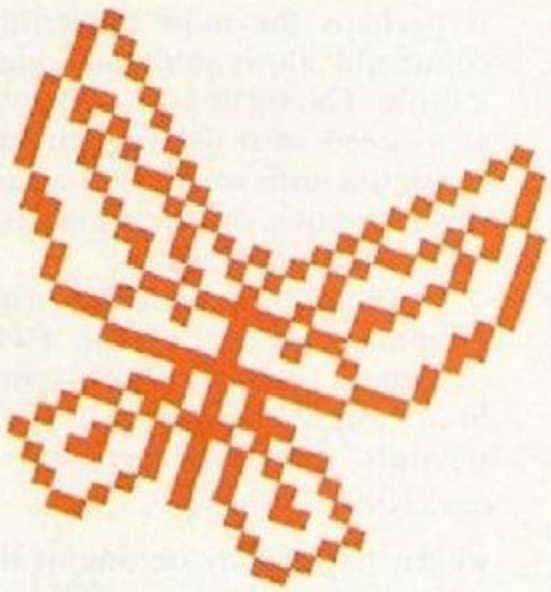

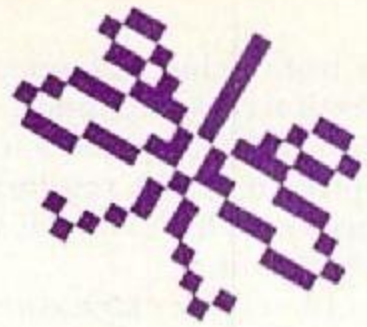

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it from being expanded in the y direction (1 = expanded, 0 = normal); and the final 1 makes it a multicolor sprite (0 = high resolution, 1 = multicolor). That's a lot of work for one command.

To set the extra colors for multicolor sprites, you use the command

SPRCOLOR <mc1,mc2>

where mc1 and mc2 are the extra colors for multicolor sprites. These colors are shared among the eight sprites.

Basic 7.0 allows for absolute sprite addressing. MOVSPR, an extremely versatile action command, has four forms, each of which is a powerful sprite command.

The first is

MOVSPR <sp#,x,y>

where sp# indicates which sprite you want to move, and x and y are the screen coordinates where you want to position the sprite.

The second form is

SPRMOV <sp#,+/- x,+/- y>

This is a relative sprite-addressing mode, where the sprite is moved a given distance from its current position.

The third form is

SPRMOV <sp#,dx;ay>

This moves the sprite a specified distance (x) at any given angle (y). The semicolon (;) signifies mode 3.

The last form,

MOVSPR <sp#,xa #>

is perhaps the most powerful. This command allows automatic motion of a sprite. The sprite is moved at angle x at a speed of n (0–15). This motion continues until you tell it to stop. With this technique, arcade games become much easier and faster.

As an additional aid in sprite programming, there is the Collision command, which allows program branching when certain types of interrupts occur. The format is

COLLISION <type,line#>

where "type" may be one of three.

Type 1 indicates when sprite-sprite collisions occur; type 2 is for sprite-screen graphic collisions; and type 3 is a light-pen interrupt. When the given interrupt occurs, Basic finishes the statement on which it's working and begins execution at the line specified in the line#. You may have more than one interrupt enabled at the same time.

You also have the function Bump (n), where, if n = 1, then the program will indicate which sprites have had a collision with other sprites, and, if n = 2, the program will return a value indicating which sprites have collided with screen graphics.

Another interesting command is SPRSAV, which allows you to save a sprite as a string variable and a string variable as a sprite. This allows you to store many sprites as variables in memory, to be recalled as needed.

If you combine this command with the graphics commands GSHAPE and SSHAPE, which allow a section of the graphics screen to be stored as a variable or written back to the screen from a variable, you have the ability to retrieve a piece of graphics screen and transfer it to a sprite for animation or to copy a sprite to the screen, where it could be made part of the background until needed again.

There are also several sprite functions that return information about a sprite's speed, position, color and other characteristics. One of these functions is

RSPCOLOR <mc#>

where mc# is either 1 or 2, depending on which color you prefer. It returns a value equal to the current color.

Another function is

RSPPOS <return,sp#,speed/position>

which returns the x or y position and the current speed of the specified sprite.

RSPRITE <sp#,ch#> with sp# = (1–8) and ch# = (0–5)
returns a specified characteristic from a specified sprite.
RSPPOS <sp#,speed/position> where speed/position is 00–2,
0 returns sprite x position; 1 returns sprite y position;
2 returns sprite speed (0–15).
RSPCOLOR <mc#> where mc# is 1–2,
1 gives sprite multicolor 1; 2 gives sprite multicolor 2.
BUMP <n> where n is 1–2,
1 indicates which sprites have collided with each other;
2 indicates which sprites have collided with background graphics.

Table 1. *Sprite functions for the program.*

SPRSAV <sp#,var$>** or **SPRSAV <var$,sp#> where sp# is sprite number and var$ is string variable. The format is **{SPRSAV source,destination}**
SPRITE <sp#,o/f,col,pr,xp,yp,mode>
sp# is sprite number 1–8.
o/f is on/off; 1 = on, 0 = off.
col is color, 1–16.
pr is priority; 0 = sprites in front, 1 = sprites in back.
xp is x-expansion; 1 = expanded, 0 = normal;
yp is y-expansion; 1 = expanded, 0 = normal;
mode is 0 = hires, 1 = multicolor.
SPRCOLOR <mc1,mc2>
mc1 = multicolor 1 for all sprites;
mc2 = multicolor 2 for all sprites.
MOVSPR has four forms:
MOVSPR <sp#,x,y>—Absolute x and y position
MOVSPR <sp#,+/- x,+/- y>—Relative x and y position
MOVSPR <sp#,dx;ay>—Moves sprite x distance at y angle
MOVSPR <sp#,xa #n speed>—Moves sprite at angle x and speed (0–15)
COLLISION <type,line#>
type is 1–3
1 = sprite/sprite collision
2 = sprite/graphic collision
3 = light pen trigger interrupt request
SPRDEF—Built-in sprite editor for standard or multicolor sprites.
BSAVE allows sprites to be saved as easily loaded binary files.
BLOAD allows sprite binary files to be easily loaded into memory.
SSHAPE <string variable,X1,Y1,X2,Y2>—Saves a given area of the hi-res screen as a string variable. It can be restored to the screen with **GSHAPE <string variable, x1,y1,mode>** or used as a sprite with SPRSAV.

Table 2. *Sprite commands for the program.*

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And still another function is

RSPRITE <return,sp#,characteristic#>

which returns the data used to create the sprite's features (i.e., color, priority or any of the parameters given in the Sprite command).

Other useful commands are BLOAD and BSAVE, which allow you to save or load sprite definitions from disk directly into the proper memory locations. This process is especially fast if you use the 1571 disk drive.

Combined with the other Basic 7.0 commands, like Do...While...Until, Begin...Bend, If...Then...Else and the many graphics commands of the C-128, you have a programming environment able to support the most dedicated graphics programmer.

The Demonstration Program

Listing 1, the Sprite Demonstration program, is an example of how easy it is to create and animate sprites on the C-128. This program uses the C-128's ability to transfer bit-mapped graphics to string variables, use them as sprites and easily detect when sprites collide.

It creates a pair of 3D dynamic sprites and places them in a setting that resembles outer space. When they touch each other, an interrupt is activated that causes the program to branch to a designated subroutine.

The sprites are made with the Circle command. Three circles are drawn, each with a slightly different set of x and y radii and a different angle of rotation. Line 100 uses the SSHAPE command to store a portion of the screen to the string variable A$(CT). Once the image is stored as a string, the screen is cleared and the next frame is drawn.

Line 120 sets the type of interrupt to be triggered (sprite-sprite) and the line to access when it is triggered. When it is activated by the collision of the two sprites, line 120 will branch to the subroutine at line 320 and change the direction, speed and color of the sprites, as well as make a little noise.

Lines 140–150 locate sprites 1 and 2 in their initial spots, using the absolute form of MOVSPR. Line 160 creates a random background of stars, each a random color. Lines 170–180 define the two sprites and turn them on with the Sprite command.

The action is contained in lines 200–290. This is a Do/While/Loop, an improved form of program looping. This tells the program: While the con-

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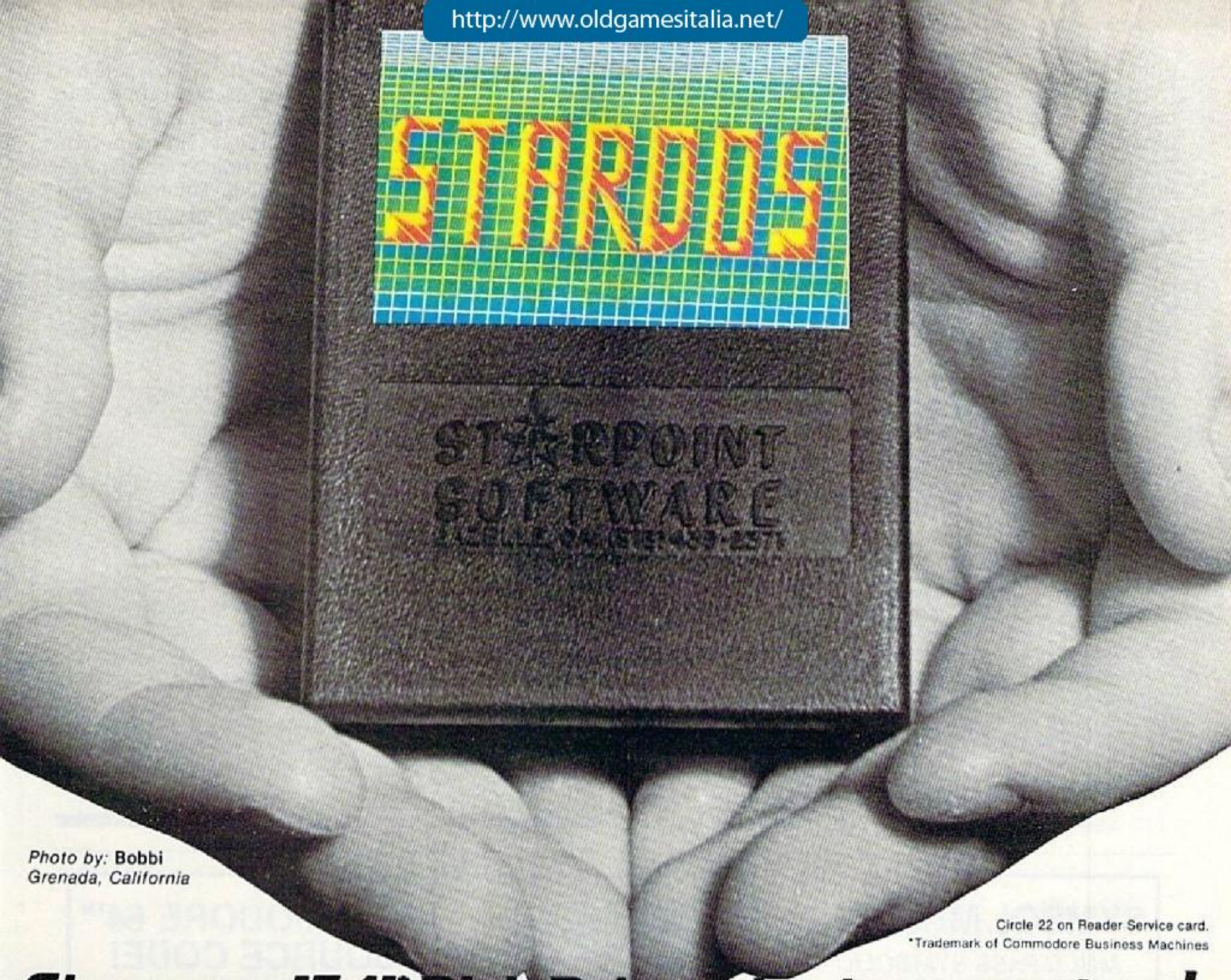

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dition given in line 200 (WHILE K<6.3) is true, do all the statements between it and the end of the loop (line 290).

This loop performs two important functions. First, the sprites are being moved with the automatic form of MOVSPR, which only requires an angle and speed to make the sprite move. In line 240, sprite 1 is moving at the angle SN, at a speed of 3. Sprite 2 is moving at the angle NS, at a speed of 1 (line 250). These sprites will continue to move until told to change direction or speed.

The use of the SPRSAV command is also important in this loop. In lines 270 and 280, the program stores the contents of the array variable A$(I) to the two sprites. These strings contain the circles drawn earlier, and, each time through the loop, the sprites are redefined with the different circles. The effect is one of a fluid 3-D animation inside the sprite!

Combining this with the automatic motion of the MOVSPR command gives you a great graphics effect. The SPRSAV command gives you the ability to use hundreds of sprites in your programs, creating very complex shapes and images. Think what you can do in your own programs. R

Address all author correspondence to Louis R. Wallace, 6124B SW 11th Place, Gainesville, FL 32607.

Listing 1. *Sprite Demonstration program.*

```
10 Z=18:DIM A$(10)
20 COLOR 0,1:COLOR 1,6:COLOR 4,1
30 REM CREATE SPRITE ANIMATION FRAMES
40 FOR I=1 TO 180 STEP Z
50 CT=CT+1
60 GRAPHIC 1,1
70 CIRCLE 1,100,100,11,9
80 CIRCLE 1,100,100,4,7,,,180-I
90 CIRCLE 1,100,100,3,7,,,I
100 SSHAPE A$(CT),89,90,112,110
110 NEXT I
120 COLLISION1,320:REM ON IRQ GOSUB 320
130 GRAPHIC1,1
140 MOVSPR 1,89+24,90+50 :REM LOCATE
150 MOVSPR 2,189+24,90+50:REM SPRITES
160 FORI=1TO100:X=INT(RND(1)*320):Y=INT(RND
    (1)*200):C=INT(RND(1)*15)+2:COLOR1,C:DR
    AW1,X,Y:NEXT:REM MAKE STARS
170 SPRITE1,1,2,1,0,0,0:REM INITIALIZE
180 SPRITE2,1,3,1,0,0,0:REM SPRITES
190 REM START OF DO LOOP
200 DO WHILE K<6.3
210 K=K+.1
220 SN=SIN(K)*360
230 NS=COS(K)*360
240 MOVSPR1,SN#3
250 MOVSPR2,NS#1
260 I=I+1:IFI>CTTHENI=1
270 SPRSAV A$(I),1
280 SPRSAV A$(I),2
290 LOOP: REM END OF DO LOOP
300 K=0
310 GOTO200
320 SN=180-SN:MOVSPR1,SN#6
330 NS=180-NS:MOVSPR2,NS#8
340 C2=C2+1:IFC2>16THENC2=3
350 SPRITE2,,C2
360 SOUND1,65535,10,0,0,5000,2
370 RETURN
```


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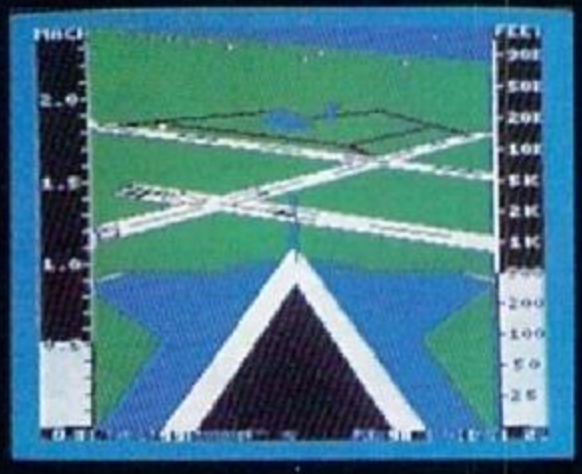

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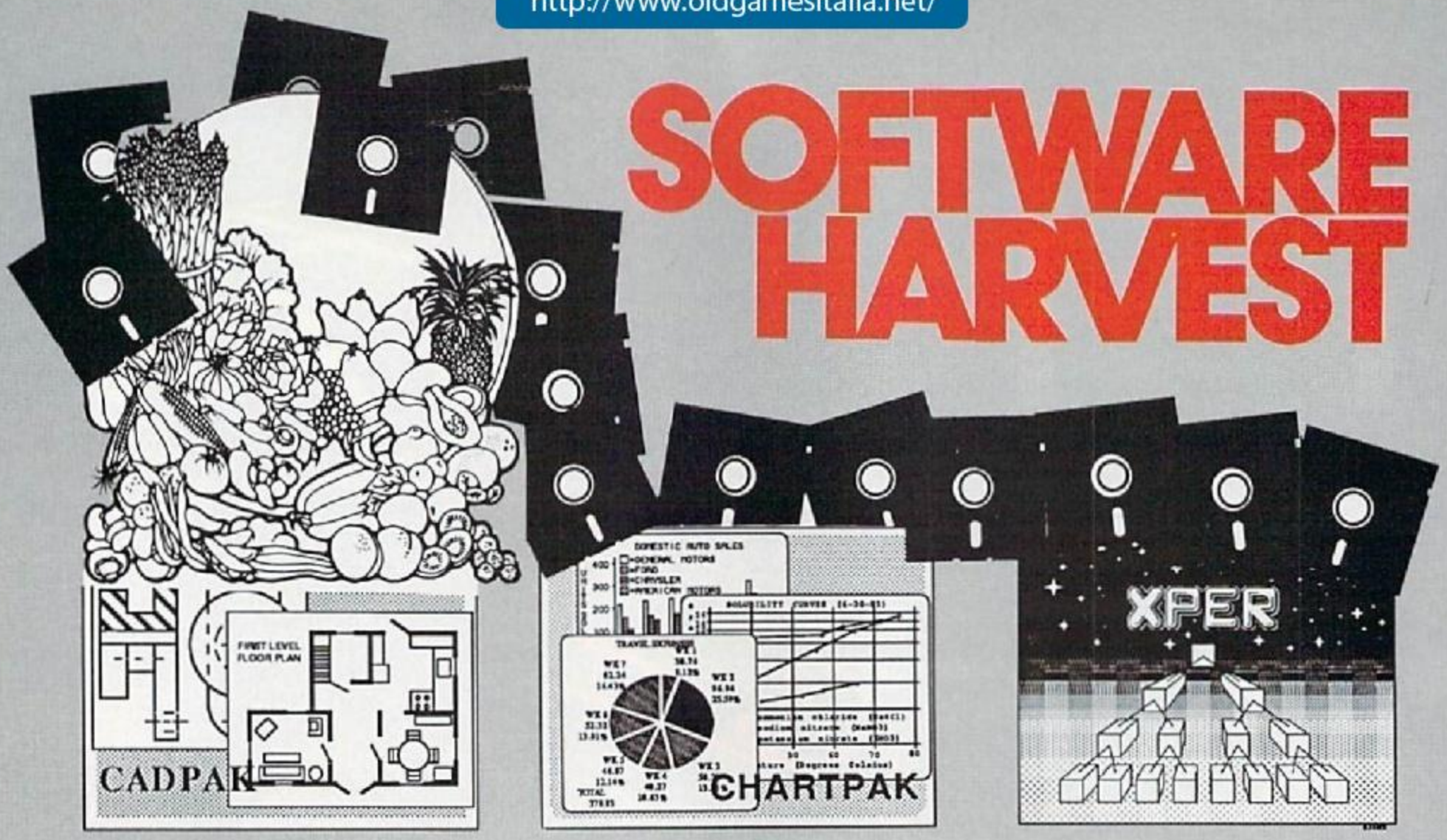

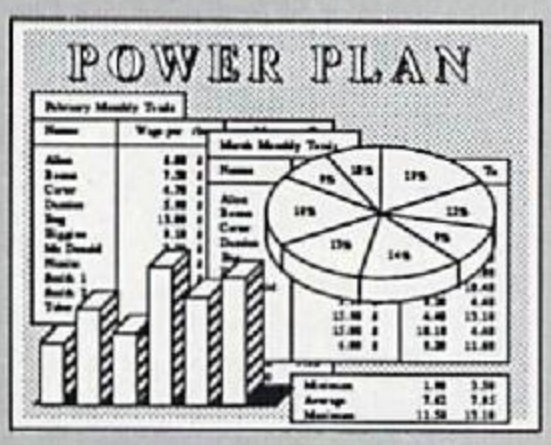

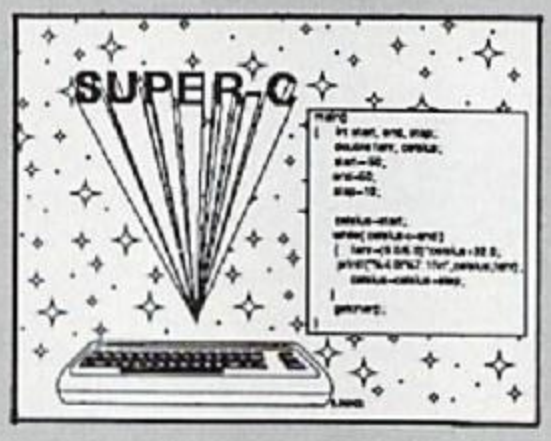

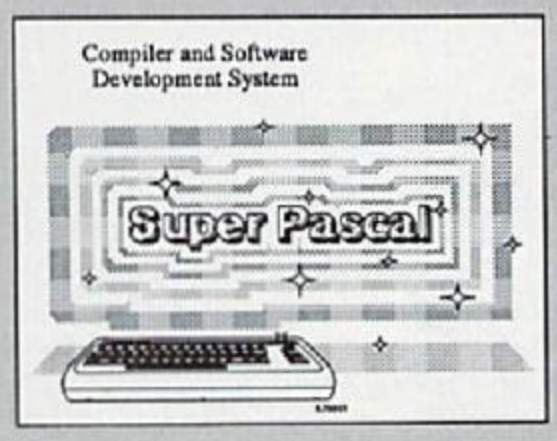

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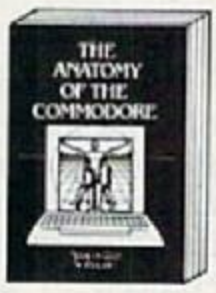

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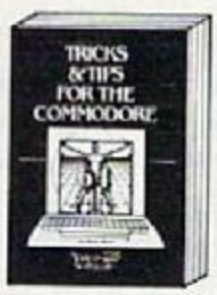

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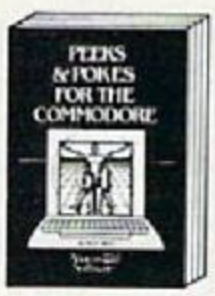

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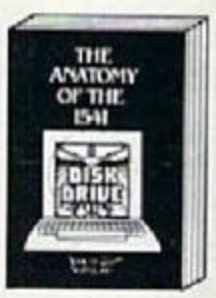

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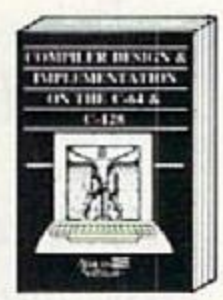

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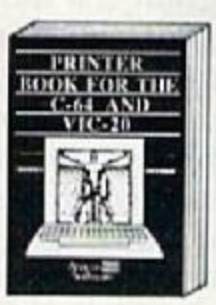

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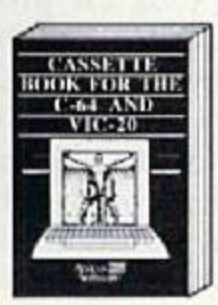

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Make a Little Music

By ARTHUR T. CHAKALIS

Make music the easy way. With your C-64 and joystick, you can create short subroutines to adorn your programs with music.

The accompanying program, Create Tunes 64, lets you easily enter sheet music to generate short musical subroutines for use in your own programs. Create Tunes 64 changes your creation into an easily manipulated Basic program.

In addition to being a programming tool, the program is a fun way to explore some of the 64's musical capabilities. Using a joystick, you may position up to 36 notes on a musical staff, with the fire-button placing or erasing notes and accessing the different program functions.

The program initially displays a title screen, then a set of instructions. At the same time, it defines the new musical note characters, loads the note data into arrays and Pokes the machine language subroutine into memory.

You will then be prompted to press the space bar. Doing so clears the screen and displays the musical staff, with your starting note at middle C. By positioning the note at various points throughout the staff and pressing the fire-button, you leave a trail of notes, thus creating your tune. At the bottom of the screen is a menu composed of letters and notes, which you'll have seen referenced in the instructions.

At this point, you are in the machine language subroutine, which reads a joystick in port 2 so you can move a note around the screen. The speed of the note's movement is variable, depending on what you want to accomplish. You can use the joystick to place your notes on the staff or to quickly access the menu. To perform a menu function, place the note on top of that function and press the fire-button.

Pressing the fire-button with the note located on the musical staff will either place or remove a note at that location. Only one note per column is permitted, so you must first erase a note you want to change before placing the new note elsewhere in that column. If you try to place two

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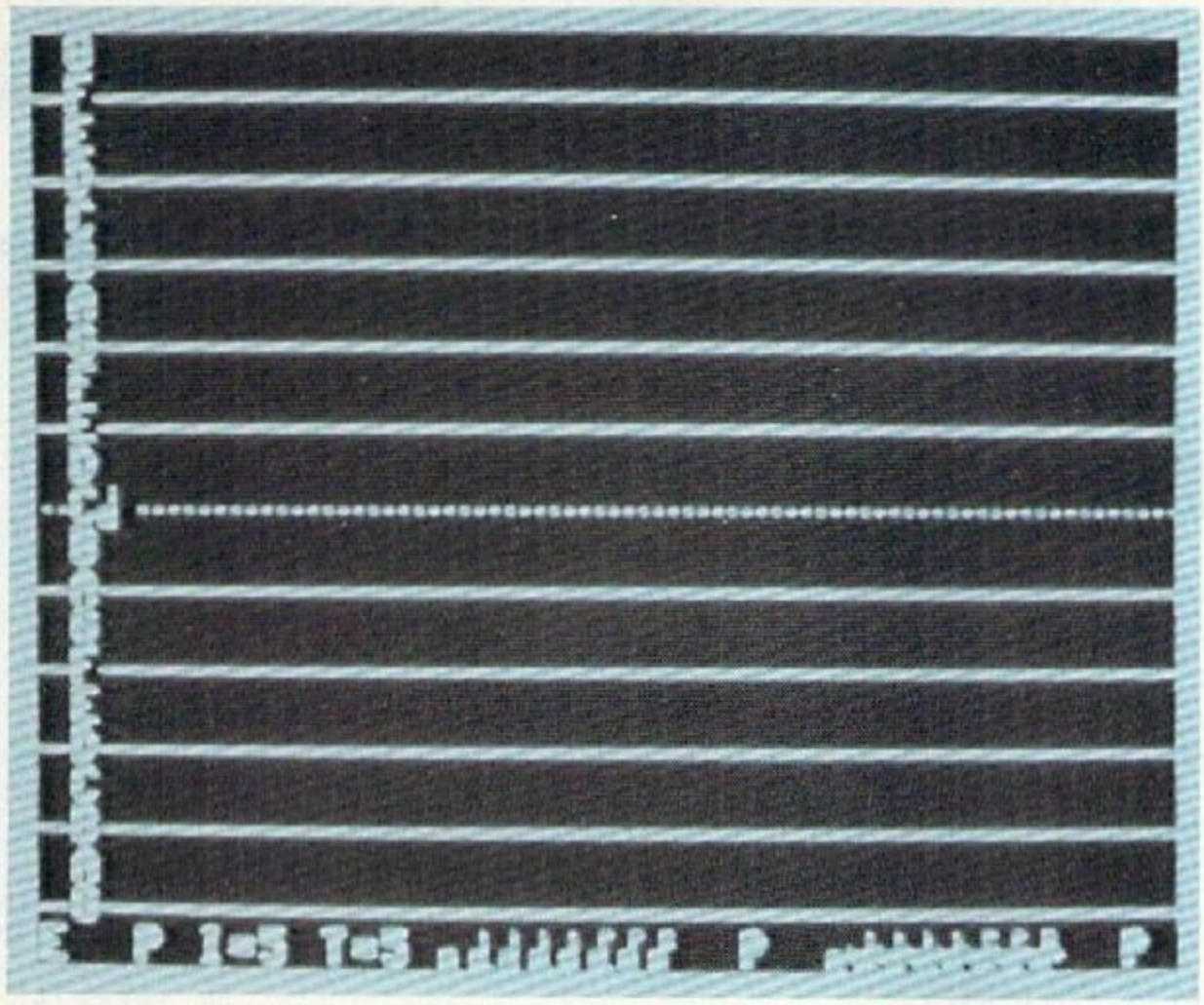

notes in the same column, the second entry is simply ignored.

The program's menu lets you select all the note values. Whole notes through sixteenth notes are available. Naturals and sharps may be directly selected. Flats are not directly available; however, you can enter the sharp of the next lower note on the staff, as it is the same pitch as the flat you want.

Pressing the fire-button while the note is over the "P" will play the notes entered. One compromise in the program is that only the notes up to the first blank column are played, so don't leave any blank columns between notes. This was an intentional choice to avoid generating Data statements containing zeros.

The letters I and T change the tune's sound and tempo. Pressing the fire-button while the note is over the letter I changes the simulated instrument sound within a range of 1–8, each number corresponding to a different instrument.

The T functions similarly, but, rather than changing the sound, it changes the tempo at which the notes are played. T has a range of 1–9, from slow to fast.

The last function available is the letter E, which exits the Note Entry mode and lets you transform your staff music into a Basic program. When you press the fire-button over E, the screen clears and asks you for a starting line number (greater than 199) and an increment between lines.

Once you've entered your starting line number, the program prompts you for the line increment. The program then proceeds to create the new lines that will play your tune; it then deletes all of the program lines of Create Tunes 64. This takes a minute or two, due to the number of lines being added and deleted.

Once this is done, list the program and you will find only the program lines that play the tune you previously entered. Save this Basic program to tape or disk. Later, you can load and run this program alone or use it as a subroutine to append to another program.

About the Program

The program itself consists of 179 consecutively numbered lines. This was done to provide maximum freedom in the selection of line numbers for the new tune program. Should you want to modify and renumber the program, pay special attention to some of the lines after 153; these contain Goto statements in quotes that will not change automatically with a renumbering utility. For the program's variables and functions, see Table 1.

The program begins with a title-screen display and then goes to a subroutine at lines 47 through 152. This first relocates character memory to 14336 and then prints the program instructions.

H(36)—high-frequency bytes
L(36)—low-frequency bytes
D(36)—note duration
HN(22)—high-frequency note data
LN(22)—low-frequency note data
HS(22)—high-frequency sharp note data
LS(22)—low-frequency sharp note data
ND(16)—note duration data
SL—current screen location
FNR(SL)—calculates row (1–25)
FNC(SL)—calculates column (1–40)
R—row
C—column
OC—old character code (charcter under the note character being moved around)
NC—new character code (note character being moved around)
W—waveform
AD—attack/decay
SR—sustain/release
HP—high pulse
LP—low pulse
X—number of notes entered
I—instrument
T—tempo
V—volume
S and SA—line numbers
IC—line number increment

Table 1. *Variables and functions used in Create Tunes 64 program.*

Character codes 64 through 82 are then redefined, note data entered into arrays and the machine language subroutine Poked into memory. After this come the instructions for pressing the space bar, printing the note-entry screen, setting initial variables and returning to the main program.

The main logic, or control loop, begins at line 7. Control is transferred to the machine language subroutine, which reads joystick port 2 and moves the note on the screen accordingly. Pressing the fire-button exits the subroutine where character and screen location data left by the subroutine are evaluated to determine what is to be done.

Memory locations 49152–49156 serve to pass this data between the machine and Basic statements. Lines 8–40 and 153–179 evaluate and perform the various program functions. REM statements within the program listing document these functions. In brief, the logic used in this program determines where you are on the screen to see whether you're entering or editing notes or accessing a function on the bottom row.

The machine language subroutine is situated at memory locations 49168

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($C010) through 49351 ($C0C7). It reads the joystick and returns to line 7 if the fire-button is pressed. If a move is read, the new location is calculated and evaluated as to whether it is within the screen boundaries set by character code 66.

If the new location is within the screen boundaries, the old character code from the present location is replaced on the screen, the character code in the new location is stored (it becomes the old character), and then the character code for the present character is placed on the screen in the new location. This process is then repeated following a delay loop that slows down execution so that the note's movement can be controlled.

For someone learning machine language, disassembling and comprehending this simple routine would be a valuable learning experience. R

Address all author correspondence to Arthur T. Chakalis, 494 Theori Ave., Gahanna, OH 43230.

Listing 1. *Create Tunes 64 program.*

```
1 POKE52,56:POKE56,56:CLR:PRINT"{SHFT CLR}{
  2 CRSR DNs}PLEASE{CRSR DN}{3 CRSR LFs}WAI
  T{CRSR DN}A{CRSR DN}{5 CRSR LFs}MOMENT{CR
  SR DN}{2 CRSR LFs}FOR"                :REM*195
2 FORI=15Ø4TO1543:POKEI,3:NEXT:PRINT"{11 CR
  SR RTs}{5 CRSR DNs}CREATE TUNES 64"
                                        :REM*4Ø
3 PRINT"{8 CRSR DNs}{2 SPACEs}BY:{3 CRSR LF
  s}{CRSR DN}ARTHUR T. CHAKALIS{CRSR DN}{6
  CRSR LFs}COPYRIGHT ,1984";            :REM*211
4 DIM H(36),L(36),D(36),HN(22),LN(22),HS(22
  ),LS(22),ND(16)                       :REM*96
5 DEF FNR(SL)=INT((SL-984)/4Ø):DEF FNC(SL)=
  SL-(FNR(SL)*4Ø)-983:GOSUB47           :REM*59
6 POKE49152,65:POKE49153,71:POKE49155,227:P
  OKE49156,5:POKE15Ø7,71                :REM*196
7 REM MAIN LOOP, TO ML SUBR.& RETURN{2 SPAC
  Es}IF FIREBUTTON PRESSED              :REM*149
8 SYS49168:OC=PEEK(49152):NC=PEEK(49153)
                                        :REM*236
9 SL=(256*PEEK(49156))+PEEK(49155):R=FNR(SL
  ):C=FNC(SL)                           :REM*1Ø7
1Ø IFR>23THEN2Ø:REM ROUTINES AT BOTTOM OF S
  CREEN                                 :REM*248
11 IFC<4THEN8:REM OUT OF RANGE, NOTES CAN'T
   BE PLACED IN 1ST. 3 COLUMNS          :REM*229
12 IFOC<66THEN16:REM GOTO PLACE NOTE ON STA
  FF                                    :REM*23Ø
13 REM REMOVE NOTE FROM STAFF           :REM*113
14 POKE49152,PEEK((R*4Ø)+985):POKESL,PEEK(4
  9152):H(C-3)=Ø:L(C-3)=Ø:GOSUB42       :REM*116
15 D(C-3)=Ø:POKESL,NC:GOTO8             :REM*183
16 IFD(C-3)<>ØTHEN8:REM PLACE NOTE IFA NOTE
   ISN'T ALREADY IN THE COLUMN          :REM*114
17 POKESL+54272,13:D(C-3)=ND(NC-66):POKE491
  52,NC:IFNC>74THEN19                   :REM*169
18 H(C-3)=HN(R-1):L(C-3)=LN(R-1):POKESL+542
  72,11:GOTO8                           :REM*24Ø
19 H(C-3)=HS(R-1):L(C-3)=LS(R-1):POKESL+542
  72,11:GOTO8                           :REM*15
2Ø IFOC>66THENPOKE49153,OC:POKESL,OC:GOTO8:
  REM CHANGE NOTE                       :REM*162
21 IFOC<>9THEN32:REM CHANGE INSTRUMENT
                                        :REM*177
22 I=1+PEEK(1952)-48:IFI>8THENI=1       :REM*152
23 IFI=1THEN W=65:AD=9:SR=Ø:HP=Ø:LP=255:GOT
  O31                                   :REM*193
24 IFI=2THEN W=17:AD=96:SR=6Ø:HP=Ø:LP=Ø:GOT
  O31                                   :REM*44
25 IFI=3THEN W=33:AD=9:SR=Ø:HP=Ø:LP=Ø:GOTO3
  1                                     :REM*47
26 IFI=4THEN W=17:AD=9:SR=Ø:HP=Ø:LP=Ø:GOTO3
  1                                     :REM*92
27 IFI=5THEN W=17:AD=Ø:SR=24Ø:HP=Ø:LP=Ø:GOT
  O31                                   :REM*249
28 IFI=6THEN W=33:AD=Ø:SR=24Ø:HP=Ø:LP=Ø:GOT
  O31                                   :REM*14
29 IFI=7THEN W=17:AD=1Ø2:SR=Ø:HP=Ø:LP=Ø:GOT
  O31                                   :REM*227
3Ø IFI=8THEN W=33:AD=12Ø:SR=Ø:HP=Ø:LP=Ø:GOT
  O31                                   :REM*248
31 POKE1952,I+48:GOTO8                  :REM*249
32 IF OC<>2ØTHEN35:REM CHANGE TEMPO      :REM*88
33 T=1+PEEK(1956)-48:IFT>9THENT=1        :REM*239
34 POKE1956,T+48:GOTO8                   :REM*8
35 IFOC<>16THEN 153:REM PLAY NOTES       :REM*21
36 X=Ø:FORI=1TO36:IFD(I)=ØTHEN38         :REM*48
37 X=X+1:NEXTI                          :REM*119
38 POKE54274,LP:POKE54275,HP:POKE54277,AD:P
  OKE54278,SR:POKE54296,V               :REM*154
39 FORI=1TOX:POKE54276,W:POKE54273,H(I):POK
  E54272,L(I)                           :REM*157
4Ø FORJ=ØTOD(I)/(1.4*T):NEXTJ:POKE54276,W-1
  :NEXTI                                :REM*94
41 FORI=54272TO543ØØ:POKEI,Ø:NEXTI:GOTO8
                                        :REM*2Ø1
42 S=54272: FORI=STOS+28:POKEI,Ø:NEXT
                                        :REM*56
43 POKE54296, 15 :POKE54277,1ØØ{2 SPACEs}:P
  OKE54278,2Ø                           :REM*181
44 POKE54276, 33 :POKE54273, 56 :POKE54272,
   99                                   :REM*13Ø
45 FORI=1TO 25 :NEXT                    :REM*199
46 FORI=STOS+28:POKEI,Ø:NEXT:RETURN     :REM*12
47 PRINTCHR$(142):REM MOVE CHARACTER{2 SPAC
  Es}MEM. LOC.                          :REM*9
48 POKE56334,PEEK(56334)AND254           :REM*212
49 POKE1,PEEK(1)AND251                   :REM*229
5Ø FORI=ØTO511:POKEI+14336,PEEK(I+53248):NE
  XT                                    :REM*46
51 POKE1,PEEK(1)OR4                      :REM*51
52 POKE56334,PEEK(56334)OR1              :REM*232
53 POKE53272,(PEEK(53272)AND24Ø)OR14
                                        :REM*165
54 REM PRINT INSTRUCTIONS                :REM*96
55 PRINT"{SHFT CLR}{2 CRSR DNs}CREATE TUNES
   DISPLAYS A MUSICAL STAFF.{CRSR DN}"
                                        :REM*255
56 PRINT"A JOYSTICK IN PORT2 MOVES A NOTE{C
  RSR RT}AROUND. "                      :REM*226
57 PRINT"THE FIRE BUTTON PLACES/ERASES A NO
  TE ON{2 SPACEs}THE STAFF.{CRSR DN}"
                                        :REM*159
58 PRINT"THE FIREBUTTON ALSO DOES OTHER FUN
  CTIONSWHEN ON THE BOTTOM LINE."       :REM*7Ø
59 PRINT"PRESSING IT WHILE OVER THE FOLLOWI
  NG{4 SPACEs}DOES:{CRSR DN}"           :REM*51
6Ø PRINT" NOTES=PICKS UP ANY NOTE SHOWN{15
  SPACEs}P=PLAY NOTES ENTERED"          :REM*74
61 PRINT"{5 SPACEs}I=CHANGE INSTRUMENT "
                                        :REM*141
62 PRINT"{5 SPACEs}T=CHANGE TEMPO"       :REM*84
63 PRINT"{5 SPACEs}E=CREATE BASIC CODE FOR
  TUNE &{12 SPACEs}DELETES ALL ELSE{CRSR D
  N}"                                   :REM*147
64 REM ENTER NEW CHARACTER DEFINITIONS
                                        :REM*134
65 PRINT"PLEASE WAIT A MOMENT{CRSR UP}":FOR
  I=512TO599:READCH:POKEI+14336,CH:NEXT
                                        :REM*233
66 DATA Ø,Ø,Ø,Ø,255,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,51,Ø,Ø,Ø,
  255,255,255,255,255,255,255,255 :REM*138
```

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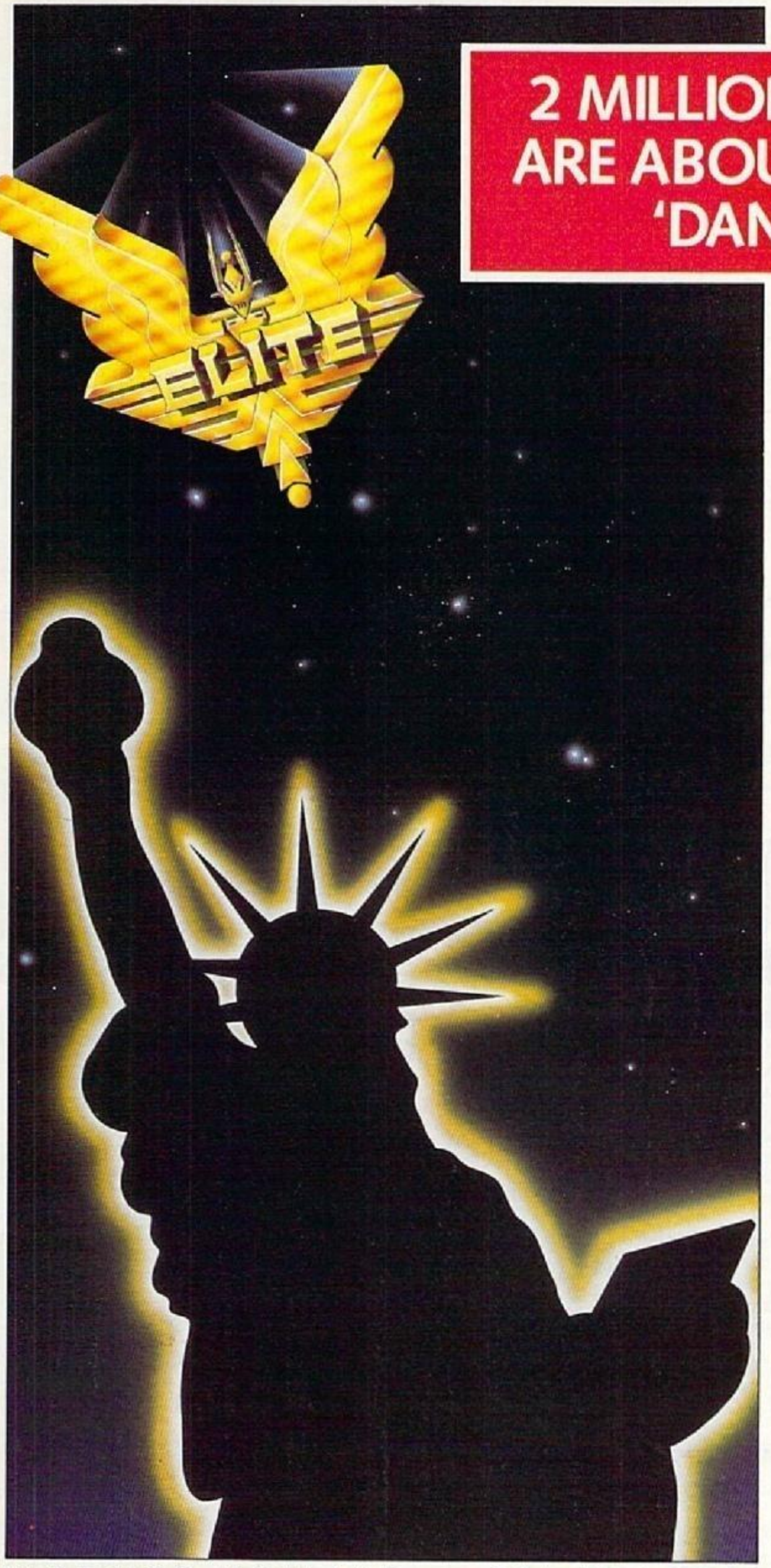

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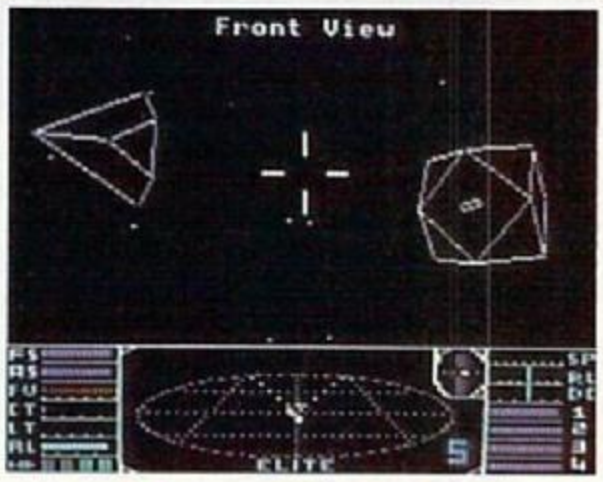

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Listing 1 continued.

```
67 DATA Ø,Ø,Ø,Ø,24Ø,144,144,24Ø,16,16,16,16
   ,24Ø,144,144,244,16,16,16,16,24Ø:REM*1Ø7
68 DATA 144,144,24Ø,16,16,16,16,24Ø,24Ø,24Ø
   ,244,16,16,16,16,24Ø,24Ø,24Ø,24Ø:REM*146
69 DATA 28,16,16,16,24Ø,24Ø,24Ø,244,28,16,1
   6,16,24Ø,24Ø,24Ø,24Ø                :REM*231
7Ø DATA 28,16,28,16,24Ø,24Ø,24Ø,24Ø:REM*144
71 FORI=536TO599:POKEI+144ØØ,PEEK(I+14336):
   NEXT                                :REM*135
72 FORI=6ØØTO663STEP8                  :REM*21Ø
73 POKEI+14339,((PEEK(I+14339))+2)     :REM*235
74 POKEI+1434Ø,(PEEK(I+1434Ø)+7)       :REM*1Ø8
75 POKEI+14341,(PEEK(I+14341)+2):NEXT
                                       :REM*123
76 REM ENTER NOTE DATA                  :REM*4Ø
77 FORI=1TO22:READ HN(I),LN(I):NEXT:REM*211
78 FORI=1TO22:READHS(I),LS(I):NEXT     :REM*58
79 FORI=1TO16:READ ND(I):NEXT          :REM*93
8Ø DATA25,3Ø,22,96,21,31,18,2Ø9,16,195,15,2
   1Ø,14,24,12,143,11,48,1Ø,143        :REM*2Ø2
81 DATA9,1Ø4,8,97,7,233,7,12,6,71,5,152,5,7
   1,4,18Ø,4,48                        :REM*73
82 DATA3,244,3,134,3,35                :REM*188
83 DATA26,156,23,181,Ø,Ø,19,239,17,195,Ø,Ø,
   14,239,13,78,11,218,Ø,Ø             :REM*2Ø7
84 DATA9,247,8,225,Ø,Ø,7,119,6,167,5,237,Ø,
   Ø,4,251,4,112                       :REM*142
85 DATAØ,Ø,3,187,3,83                  :REM*255
86 DATA128Ø,96Ø,64Ø,48Ø,32Ø,24Ø,16Ø,8Ø,128Ø
   ,96Ø,64Ø,48Ø,32Ø,24Ø,16Ø,8Ø         :REM*2Ø8
87 REM POKE ML SUBR. INTO MEM.         :REM*25
88 FOR AD= 49168TO 49351:READ DA:POKEAD,DA:
   NEXTAD                              :REM*8
89 DATA 216, 173, Ø, 22Ø, 2Ø1, 111     :REM*153
9Ø DATA 24Ø, 24, 2Ø1, 126, 24Ø, 21     :REM*23Ø
91 DATA 2Ø1, 125, 24Ø, 4Ø, 2Ø1, 123    :REM*29
92 DATA 24Ø, 54, 2Ø1, 119, 24Ø, 68     :REM*112
93 DATA 162, 16Ø, 142, 5, 192, 76      :REM*125
94 DATA 17, 192, 96, 56, 173, 3         :REM*6
95 DATA 192, 233, 4Ø, 133, 251, 173     :REM*7
96 DATA 4, 192, 233, Ø, 133, 252        :REM*56
97 DATA 76, 123, 192, 133, 252, 76     :REM*181
98 DATA 123, 192, 24, 173, 3, 192       :REM*6Ø
99 DATA 1Ø5, 4Ø, 133, 251, 173, 4       :REM*97
1ØØ DATA 192, 1Ø5, Ø, 133, 252, 76     :REM*192
1Ø1 DATA 123, 192, 56, 173, 3, 192     :REM*119
1Ø2 DATA 233, 1, 133, 251, 173, 4      :REM*114
1Ø3 DATA 192, 233, Ø, 133, 252, 76      :REM*69
1Ø4 DATA 123, 192, 24, 173, 3, 192      :REM*66
1Ø5 DATA 1Ø5, 1, 133, 251, 173, 4      :REM*125
1Ø6 DATA 192, 1Ø5, Ø, 133, 252, 16Ø    :REM*3Ø
1Ø7 DATA Ø, 177, 251, 2Ø1, 66, 2Ø8     :REM*241
1Ø8 DATA 3, 76, 17, 192, 141, 2         :REM*144
1Ø9 DATA 192, 173, 3, 192, 133, 253:REM*159
11Ø DATA 173, 4, 192, 133, 254, 173:REM*174
111 DATA Ø, 192, 145, 253, 173, 2       :REM*83
112 DATA 192, 141, Ø, 192, 173, 1      :REM*138
113 DATA 192, 145, 251, 165, 251, 141
                                        :REM*27
114 DATA 3, 192, 165, 252, 141, 4       :REM*26
115 DATA 192, 173, 5, 192, 2Ø1, 32      :REM*95
116 DATA 24Ø, 4, 56, 233, 32, 24       :REM*222
117 DATA 141, 5, 192, 17Ø, 16Ø, Ø      :REM*159
118 DATA 136, 2Ø8, 253, 2Ø2, 2Ø8, 248
                                       :REM*156
119 DATA 24, 76, 17, 192                :REM*95
12Ø PRINT"PRESS SPACE BAR TO CONTINUE":GOSU
    B42                                :REM*154
121 GETA$:IFA$<>" "THEN121             :REM*213
122 REM SCREEN SETUP                   :REM*2Ø8
123 POKE5328Ø,15:POKE53281,11:PRINT"{SHFT C
    LR}":POKE53281,15:POKE646,11       :REM*245
124 PRINT"{4Ø SHFT Bs}";               :REM*126
125 PRINT"{SHFT B} G{36 SPACEs}{SHFT B}";
                                       :REM*135
126 PRINT"{SHFT B}{SHFT *}F{36 SHFT *s}{SHF
    T B}";                             :REM*18
127 PRINT"{SHFT B} E{36 SPACEs}{SHFT B}";
                                        :REM*9
128 PRINT"{SHFT B}{SHFT *}D{36 SHFT *s}{SHF
    T B}";                            :REM*148
129 PRINT"{SHFT B} C{36 SPACEs}{SHFT B}";
                                      :REM*137
13Ø PRINT"{SHFT B}{SHFT *}B{36 SHFT *s}{SHF
    T B}";                             :REM*2Ø
131 PRINT"{SHFT B} A{36 SPACEs}{SHFT B}";
                                       :REM*11
132 PRINT"{SHFT B}{SHFT *}G{36 SHFT *s}{SHF
    T B}";                             :REM*88
133 PRINT"{SHFT B} F{36 SPACEs}{SHFT B}";
                                       :REM*79
134 PRINT"{SHFT B}{SHFT *}E{36 SHFT *s}{SHF
    T B}";                            :REM*218
135 PRINT"{SHFT B} D{36 SPACEs}{SHFT B}";
                                      :REM*2Ø9
136 PRINT"{SHFT B}{SHFT A}C{36 SHFT As}{SHF
    T B}";                              :REM*2
137 PRINT"{SHFT B} B{36 SPACEs}{SHFT B}";
                                       :REM*81
138 PRINT"{SHFT B}{SHFT *}A{36 SHFT *s}{SHF
    T B}";                            :REM*22Ø
139 PRINT"{SHFT B} G{36 SPACEs}{SHFT B}";
                                      :REM*149
14Ø PRINT"{SHFT B}{SHFT *}F{36 SHFT *s}{SHF
    T B}";                             :REM*32
141 PRINT"{SHFT B} E{36 SPACEs}{SHFT B}";
                                       :REM*23
142 PRINT"{SHFT B}{SHFT *}D{36 SHFT *s}{SHF
    T B}";                            :REM*162
143 PRINT"{SHFT B} C{36 SPACEs}{SHFT B}";
                                      :REM*151
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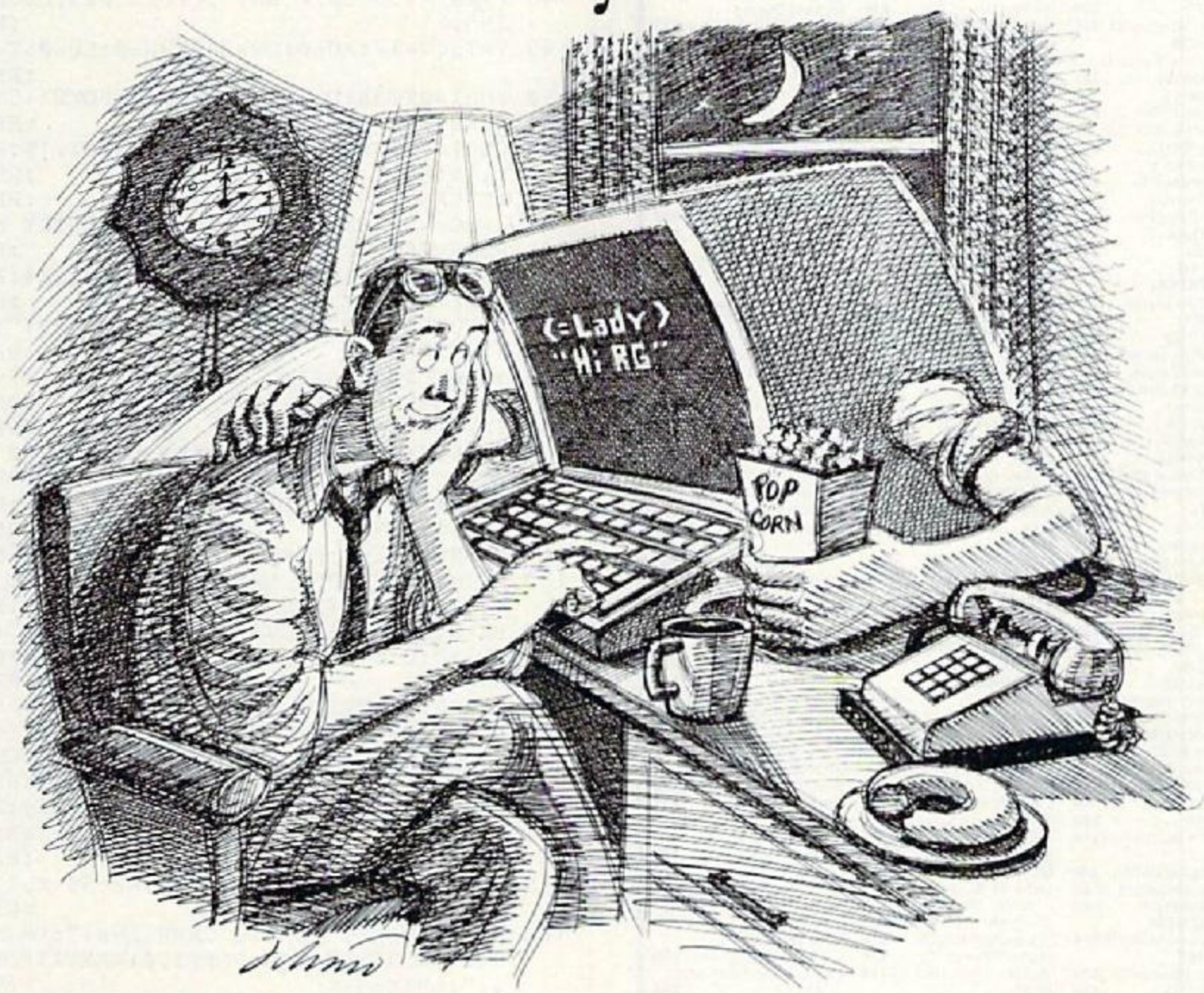

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Listing 1 continued.

```
144 PRINT"{SHFT B}{SHFT *}B{36 SHFT *s}{SHF
    T B}";                                  :REM*34
145 PRINT"{SHFT B} A{36 SPACEs}{SHFT B}";
                                            :REM*25
146 PRINT"{SHFT B}{SHFT *}G{36 SHFT *s}{SHF
    T B}";                                  :REM*1Ø2
147 PRINT"{SHFT B}E{2 SPACEs}P I=5 T=5 {SHF
    T C}{SHFT D}{SHFT E}{SHFT F}{SHFT G}{SH
    FT H}{SHFT I}{SHFT J}{2 SPACEs}P{2 SPAC
    Es}{SHFT K}{SHFT L}{SHFT M}{SHFT N}{SHF
    T O}{SHFT P}{SHFT Q}{SHFT R}{2 SPACEs}P
     {SHFT B}";                             :REM*193
148 PRINT"{39 SHFT Bs}";:POKE2Ø23,66:POKE56
    295,11                                  :REM*6Ø
149 V=15:W=17:AD=Ø:SR=24Ø:HP=Ø:LP=Ø:T=5
                                            :REM*223
15Ø FORI=ØTO39:POKEI+55296,15:POKEI+56256,1
    5:NEXT                                  :REM*224
151 FORI=55335TO56255STEP4Ø:POKEI,15:POKEI+
    1,15:NEXT                               :REM*115
152 RETURN                                  :REM*21Ø
153 IFOC<>5THEN8:REM EXIT NOTE ENTRY & GENE
    RATE NEW PROGRAM                        :REM*23
154 POKE53272,(PEEK(53272)AND24Ø)OR4:PRINT"
    {SHFT CLR}"                             :REM*14
155 INPUT"STARTING LINE NUMBER(<199)";S:IFS
    >199THEN157                             :REM*193
156 INPUT"TRY AGAIN, MUST BE ABOVE 199";S:I
    FS<199THEN156                           :REM*12Ø
157 INPUT"INCREMENT";IC                     :REM*197
158 PRINT"{SHFT CLR}{2 CRSR DNs}":X=Ø
                                            :REM*254
159 FORI=1TO36:IFD(I)=ØTHEN161              :REM*89
16Ø X=X+1:NEXTI                             :REM*242
161 SA=S+(7*IC):FORI=1TOXSTEP4              :REM*133
162 PRINTSA;"{CRSR LF}DATA";:FORJ=ØTO3:IF(I
    +J)>XTHENPRINTCHR$(2Ø):GOTO165          :REM*62
163 PRINTH(I+J);"{CRSR LF},";L(I+J);"{CRSR
    LF},";D(I+J);"{CRSR LF},";:NEXTJ:PRINTC
    HR$(2Ø)                                 :REM*245
164 SA=SA+IC:NEXTI                          :REM*152
165 PRINT"S=";S;"{CRSR LF}:IC=";IC;"{CRSR L
    F}:LP=";LP;"{CRSR LF}:HP=";HP;"{CRSR LF
    }:AD=";AD;"{CRSR LF}:SR=";SR;           :REM*251
166 PRINT"{CRSR LF}:V=";V;"{CRSR LF}:W=";W;
    "{CRSR LF}:T=";T;"{CRSR LF}:X=";X;"{CRS
    R LF}:GOTO168"                          :REM*12Ø
167 POKE198,1Ø:FORK=1TO1Ø:POKE63Ø+K,13:NEXT
    K:PRINT"{HOME}":END                     :REM*231
168 PRINT"{SHFT CLR}{2 CRSR DNs}":PRINTS;"F
    ORI=54272TO543ØØ:POKEI,Ø:NEXTI:POKE5427
    4,";LP:S=S+IC                           :REM*68
169 PRINTS;"POKE54275,";HP;"{CRSR LF}:POKE5
    4277,";AD;"{CRSR LF}:POKE54278,";SR:S=S
    +IC                                     :REM*1Ø7
17Ø PRINTS;"POKE54296,";V;"{CRSR LF}:W=";W;
    "{CRSR LF}:T=";T:S=S+IC                 :REM*242
171 PRINTS;"FORI=1TO";X;"{CRSR LF}:READ H,L
    ,D:POKE54276,W:POKE54273,H":S=S+IC
                                            :REM*137
172 PRINTS;"POKE54272,L:FORJ=ØTOD/T:NEXTJ":
    S=S+IC                                  :REM*176
173 PRINTS;"POKE54276,W-1:NEXTI":S=S+IC
                                            :REM*167
174 PRINTS;"FORI=54272TO543ØØ:POKEI,Ø:NEXTI
    "                                       :REM*222
175 PRINT"LN=Ø:GOTO177"                     :REM*1Ø7
176 POKE198,9:FORK=1TO9:POKE63Ø+K,13:NEXTK:
    PRINT"{HOME}":END                       :REM*138
177 PRINT"{SHFT CLR}{2 CRSR DNs}":FORI=LNTO
    LN+7:PRINTI:NEXTI                       :REM*227
178 PRINT"LN=";LN+8;":IFLN<179GOTO177"
                                            :REM*1Ø6
179 POKE198,9:FORK=1TO9:POKE63Ø+K,13:NEXTK:
    PRINT"{HOME}":END                       :REM*141
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The transition from chips to chords won't produce sour notes if you use these basic techniques.

Bach to Basic

By LARRY COTTON

Johann Sebastian Bach was no dummy. Some two centuries ago, he wrote what would become one of the musical classics of all time, and he did it completely without the aid of a personal computer or word processor.

Furthermore, he had the temerity to promote a little-known scheme of *tempering* the musical scale into 12 equal steps, which became the standard method of tuning musical instruments. The result of his efforts—published in 24 installments—is known as the *Well-tempered Clavier*.

Now, well-tempered doesn't mean that the clavier (the forerunner of the piano) had an even disposition—far from it; the instrument had to be tuned daily, and its strings broke with amazing regularity. What it means is that its temperament (i.e., its tuning) was even and equal. Every note's frequency had (and has) the same arithmetic relationship to its adjacent neighbor. We can prove this very quickly with the help of the Commodore 64.

The Magic Root

Take a look at *The Commodore 64 Programmer's Reference Guide*, Appendix E. If you don't have one, look at your *Commodore 64 User's Guide*, Appendix M. The two values in the right-hand column are the ones that would be Poked into memory addresses to play a particular note. Check out C-3, whose values are 8 and 97 (8 and 147 in the old user's guide). Multiply the 8 by 256, then add 97 and you get 2145, which appears in the decimal column in the reference guide.

Now look at the values for C#-3. Doing the same calculations on 8 and 225 yields 2273. What relationship does 2273 have to 2145? Furthermore, what relationship does 2408 (the next higher number) have to 2273? Give up? All right, here it is: Simply multiply the lower number by 1.05946309 to get the next higher number. Where did 1.05946309 come from? It's the twelfth root of two! Expressed so the C-64 can understand, it's 2↑(1/12).

Any root of a number may be calculated this way. A simpler example is the square root, say, of 9, which we know is 3. The C-64 has two ways of finding the square root of 9: SQR(9) and 9↑(½). The *cube* root of eight is 2 ($2 \times 2 \times 2 = 8$). This can be expressed 8↑(⅓). Thus the *twelfth* root of 2 is calculated as 2↑(1/12).

Try that right now with your computer in the Immediate mode. Type PRINT 2↑(1/12) and press the return key. I'm in big trouble if you don't get 1.05946309. Now take, for example, 2145 (the value for C-3) from the decimal column in Appendix E, *Commodore 64 Programmer's Reference Guide*, and type PRINT 2145*2↑(1/12). The answer could be rounded to 2273, the decimal value for C#-3.

Notes on The Accompanist

In the listing, note factors F1 through F4 in lines 150–165. This is one place where the twelfth root of 2 comes in. It is used to calculate the minor 3rd, major 3rd, 5th and 7th tones, which form three-note chords when selectively heard with the root tone (lowest note).

The other place is in line 1000, which increments the lowest decimal number to correspond to the 12 steps in a well-tempered chromatic scale. Result: only one number (N) is used to calculate values for 48 three-note chords, thanks to that magic twelfth root of 2!

RUN It Right

C-64; C-128 (in C-64 mode)

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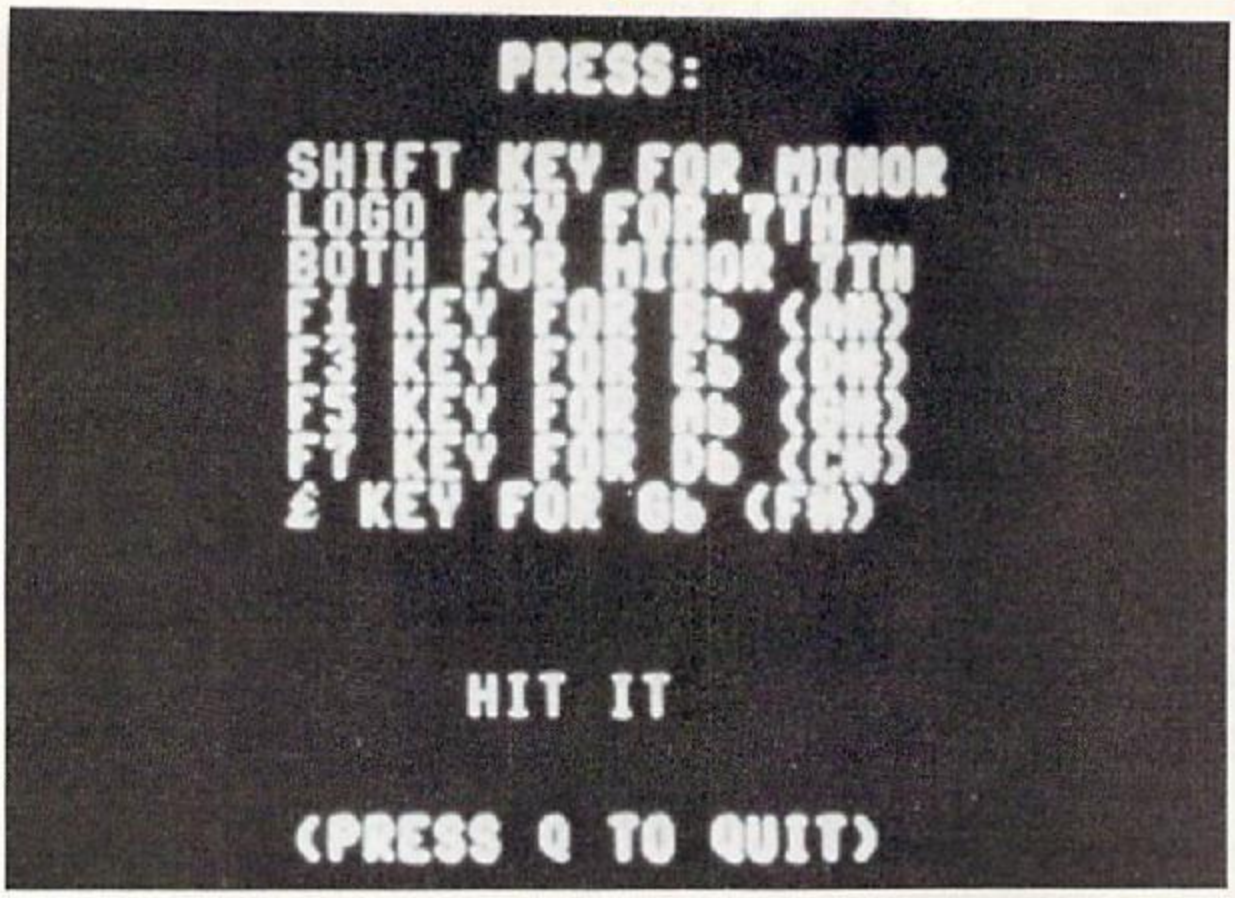

The rest of the program is fairly straightforward. Lines 5 through 70 set up the screen and sound chip for organ-like tones. Line 170 lets you change the value of N (the lowest decimal number corresponding to the lowest pitch heard) to raise or lower the overall pitch of the tones that you'll hear. Doubling N would cause everything to sound exactly one octave higher.

Lines 200–340 do our calculating. Lines 450–525 look at two very useful memory locations, 653 and 197, which contain information about the keyboard—the status of the shift, Commodore and CTRL keys (we'll use only the first two), and which key is pressed. Note especially lines 451 and 452, which detect if the run/stop key or *no* key is pressed, and line 525, which detects whether or not the Q key is pressed, to quit the program.

Lines 600 through 602 Poke in the chords' frequencies and line 610 turns on the sound.

Observe that the sound is turned off when the chord key is released, which Pokes zeroes into frequency registers, instead of the usual way of Poking a 64 into the voice registers. This avoids the release cycle of the ADSR envelope, thus speeding up response to the keyboard.

There is almost no delay between pressing a key and hearing the most-encountered chords, like C, F and G, and only a fraction of a second's delay when you want to hear the least-used chords, like E, B or D flat.

Lines 2000 to the end contain subroutines for creating silence when a key is released and for exiting the program. Unfamiliar memory addresses might be 657 and 808, which enable or disable the shift and run/stop keys, respectively, and 198, which clears the keyboard buffer for a clean screen on quitting.

How to Use the Program

Get a piece of sheet music or a do-it-yourself guitar book and run the program. When you see HIT IT! on the screen, press a key. Which key? Just above the five-line staff with the treble clef on it are chord letters like C, F, C, Bb and so on, maybe with an accompanying guitar-fingering diagram. What, no chords? Go get another piece of sheet music!

Now press the key that corresponds to the chord letter. A nice, mellow three-note sound should emanate from your television or other amplification means. What you play simulates an organist's accompaniment to a vocal or instrumental solo.

Should you encounter Bb, Eb, Ab, Db or Gb chords, use the function and £ keys, as instructed at the top of the screen. When you press only the chord (letter, function or £) keys, what you hear is the *major* chord.

Now, do an experiment. While holding down the chord key, press the shift key. The chord you hear is the corresponding *minor* chord, shown on the music as a lowercase m next to the chord letter. Again, while holding the chord key, press the Commodore key. What you hear is a three-note *seventh* chord, written in music as, say, G7. When you hold down all three (chord, shift and Commodore) keys, you'll hear, logically enough, the corresponding *minor seventh* chord, written, say, as Fm7.

Normally the screen would flicker back and forth between the two character sets when you press the Commodore key and the shift key simultaneously, but a Poke of 128 to location 657 effectively disables the shift key. (The keyboard matrix values are still found at 653.)

In the unlikely event that you encounter such chords as A#, D#, G#, C# or F#, use function and £ keys for Bb, Eb, Ab, Db and Gb, respectively. Thanks to the well-tempered scale, A# is the same as Bb, D# is the same as Eb, and so forth! Feel free to change the voices, pitch and envelopes to suit your own taste. After all, Bach would have if he'd had a C-64! R

Address all author correspondence to Larry Cotton, 3513 Canterbury Road, New Bern, NC 28560.

Listing 1. *The Accompanist program.*

```
5 POKE8Ø8,225:POKE657,128:REM DISABLE RUN/S
  TOP AND SHIFT KEYS                    :REM*175
6 POKE53281,Ø:POKE5328Ø,14:PRINTCHR$(5)
                                        :REM*2Ø
7 PRINTCHR$(147)CHR$(14):REM CLEAR HOME AND
   LOWER CASE                           :REM*93
8 PRINT:PRINT:PRINTTAB(17)"{SHFT P}{SHFT R}
  {SHFT E}{2 SHFT Ss}:"                 :REM*68
1Ø PRINT:PRINTTAB(7)"{4 SPACEs}{CTRL 4}{SHF
   T S}{SHFT H}{SHFT I}{SHFT F}{SHFT T}{CTR
   L 2} {SHFT K}{SHFT E}{SHFT Y}{SHFT SPACE
   }{SHFT F}{SHFT O}{SHFT R} {SHFT M}{SHFT
   I}{SHFT N}{SHFT O}{SHFT R}"           :REM*42
11 PRINTTAB(7)"{4 SPACEs}{CTRL 4}{SHFT L}{S
   HFT O}{SHFT G}{SHFT O}{CTRL 2}{SHFT SPAC
   E}{SHFT K}{SHFT E}{SHFT Y}{SHFT SPACE}{S
   HFT F}{SHFT O}{SHFT R}{SHFT SPACE}7{SHFT
    T}{SHFT H}"                         :REM*149
```

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Listing 1 continued.

```
12 PRINTTAB(7)"{4 SPACEs}{CTRL 4}{SHFT B}{S
   HFT O}{SHFT T}{SHFT H}{CTRL 2}{SHFT SPAC
   E}{SHFT F}{SHFT O}{SHFT R}{SHFT SPACE}{S
   HFT M}{SHFT I}{SHFT N}{SHFT O}{SHFT R}{S
   HFT SPACE}7{SHFT T}{SHFT H}"     :REM*236
13 PRINTTAB(7)"{4 SPACEs}{CTRL 8}{SHFT F}1{
   SHFT SPACE}{SHFT K}{SHFT E}{SHFT Y}{CTRL
    2}{SHFT SPACE}{SHFT F}{SHFT O}{SHFT R}{
   SHFT SPACE}{SHFT B}B ({SHFT A}#)":REM*25
14 PRINTTAB(7)"{4 SPACEs}{CTRL 8}{SHFT F}3
   {SHFT K}{SHFT E}{SHFT Y}{CTRL 2}{SHFT SP
   ACE}{SHFT F}{SHFT O}{SHFT R}{SHFT SPACE}
   {SHFT E}B ({SHFT D}#)"           :REM*11Ø
15 PRINTTAB(7)"{4 SPACEs}{CTRL 8}{SHFT F}5
   {SHFT K}{SHFT E}{SHFT Y}{CTRL 2}{SHFT SP
   ACE}{SHFT F}{SHFT O}{SHFT R}{SHFT SPACE}
   {SHFT A}B ({SHFT G}#)"           :REM*219
16 PRINTTAB(7)"{4 SPACEs}{CTRL 8}{SHFT F}7
   {SHFT K}{SHFT E}{SHFT Y}{CTRL 2}{SHFT SP
   ACE}{SHFT F}{SHFT O}{SHFT R}{SHFT SPACE}
   {SHFT D}B ({SHFT C}#)"           :REM*222
17 PRINTTAB(7)"{4 SPACEs}{CTRL 8}{LB.} {SHF
   T K}{SHFT E}{SHFT Y}{CTRL 2}{SHFT SPACE}
   {SHFT F}{SHFT O}{SHFT R}{SHFT SPACE}{SHF
   T G}B ({SHFT F}#)"               :REM*111
2Ø FORT=1TO3:PRINT:NEXT:PRINTTAB(11)"{SHFT
   P}{SHFT L}{SHFT E}{SHFT A}{SHFT S}{SHFT
   E}{SHFT SPACE}{SHFT W}{SHFT A}{SHFT I}{S
   HFT T} 1Ø {SHFT S}{SHFT E}{SHFT C}."
                                    :REM*2ØØ
21 PRINT:PRINT"{2 SPACEs}{SHFT W}{SHFT H}{S
   HFT I}{SHFT L}{SHFT E}{SHFT SPACE}{SHFT
   W}{SHFT A}{SHFT I}{SHFT T}{SHFT I}{SHFT
   N}{SHFT G}, {SHFT P}{SHFT L}{SHFT E}{SHF
   T A}{SHFT S}{SHFT E}{SHFT SPACE}{SHFT T}
   {SHFT U}{SHFT R}{SHFT N}{SHFT SPACE}{SHF
   T U}{SHFT P}{SHFT SPACE}{SHFT V}{SHFT O}
   {SHFT L}{SHFT U}{SHFT M}{SHFT E}."
                                    :REM*247
22 FORU=1TO15:PRINTCHR$(145);:NEXTU:REM*1Ø6
25 FORU=1TO29:PRINTCHR$(16Ø);:NEXTU:PRINTCH
   R$(145)                          :REM*25
3Ø FORL=54272TO54295:POKEL,Ø:NEXT:POKE54296
   ,15                              :REM*1Ø6
4Ø V(1)=54276:V(2)=54283:V(3)=5429Ø:REM*1Ø4
5Ø VH(1)=54273:VL(1)=54272:VH(2)=5428Ø:VL(2
   )=54279:VH(3)=54287:VL(3)=54286 :REM*212
6Ø POKE54277,4:POKE54278,19Ø:REM ADSRV1
                                    :REM*9Ø
61 POKE54284,4:POKE54285,19Ø:REM ADSRV2
                                    :REM*167
62 POKE54291,4:POKE54292,19Ø:REM ADSRV3
                                    :REM*242
7Ø POKE54275,8:POKE54282,8:POKE54289,8:REM
   5Ø% DUTY CYCLE SQUARE WAVE       :REM*25Ø
1ØØ DIMA(4,12),B(4,12),C(4,12),D(4,12),E(4,
   12),F(4,12)                      :REM*194
15Ø F1=(2{UP ARROW}(1/12)){UP ARROW}3:REM M
   INOR THIRD                       :REM*146
155 F2=(2{UP ARROW}(1/12)){UP ARROW}4:REM M
   AJOR THIRD                       :REM*159
16Ø F3=(2{UP ARROW}(1/12)){UP ARROW}7:REM F
   IFTH                             :REM*21Ø
165 F4=(2{UP ARROW}(1/12)){UP ARROW}1Ø:REM
   SEVENTH                          :REM*81
17Ø N=2145:REM DECIMAL NO. FROM APP.E PROGR
   AMMER'S REFERENCE GUIDE (C-3)    :REM*1Ø4
18Ø K=256                           :REM*2Ø8
2ØØ X=Ø:Q=N:FORY=ØTO11:GOSUB3ØØ:GOSUB32Ø:GO
   SUB33Ø:GOSUB1ØØØ:NEXTY           :REM*48
21Ø X=1:Q=N:FORY=ØTO11:GOSUB3ØØ:GOSUB31Ø:GO
   SUB33Ø:GOSUB1ØØØ:NEXTY           :REM*72
22Ø X=2:Q=N:FORY=ØTO11:GOSUB3ØØ:GOSUB32Ø:GO
   SUB34Ø:GOSUB1ØØØ:NEXTY           :REM*166
23Ø X=3:Q=N:FORY=ØTO11:GOSUB3ØØ:GOSUB31Ø:GO
   SUB34Ø:GOSUB1ØØØ:NEXTY           :REM*19Ø
25Ø GOTO4ØØ                         :REM*2Ø4
3ØØ A(X,Y)=INT(Q/K):B(X,Y)=INT(Q-(K*A(X,Y))
   ):RETURN:REM ROOT                :REM*233
31Ø C(X,Y)=INT(Q*F1/K):D(X,Y)=INT(Q*F1-(K*C
   (X,Y))):RETURN:REM MINOR THIRD   :REM*21
32Ø C(X,Y)=INT(Q*F2/K):D(X,Y)=INT(Q*F2-(K*C
   (X,Y))):RETURN:REM MAJOR THIRD   :REM*193
33Ø E(X,Y)=INT(Q*F3/K):F(X,Y)=INT(Q*F3-(K*E
   (X,Y))):RETURN:REM FIFTH         :REM*39
34Ø E(X,Y)=INT(Q*F4/K):F(X,Y)=INT(Q*F4-(K*E
   (X,Y))):RETURN:REM SEVENTH       :REM*189
4ØØ FORQ=1TO12:PRINT:NEXT:PRINT"{16 SPACEs}
   {COMD 3}{SHFT H}{SHFT I}{SHFT T}{SHFT S
   PACE}{SHFT I}{SHFT T}{CTRL 2}{8 SPACEs}
   "                                :REM*15
41Ø PRINT:FORU=1TO39:PRINTCHR$(16Ø);:NEXT
                                    :REM*213
42Ø PRINT:PRINTTAB(11)"({SHFT P}{SHFT R}{SH
   FT E}{2 SHFT Ss} {CTRL 8}{SHFT Q}{CTRL
   2} {SHFT T}{SHFT O} {SHFT Q}{SHFT U}{SH
   FT I}{SHFT T})"                  :REM*183
43Ø FORU=1TO4:PRINTCHR$(145);:NEXTU:REM*165
45Ø U=PEEK(197):V=PEEK(653)         :REM*215
451 IFU=63THEN45Ø:REM RUN/STOP KEY  :REM*46
452 IFU=64THEN2ØØØ:REM NO KEY       :REM*83
453 IFV=ØTHENX=Ø:PRINTTAB(19)"{SHFT M}{SHFT
    A}{SHFT J} {CRSR UP}":GOTO5ØØ   :REM*34
454 IFV=1THENX=1:PRINTTAB(19)"{SHFT M}{SHFT
    I}{SHFT N} {CRSR UP}":GOTO5ØØ :REM*133
455 IFV=2THENX=2:PRINTTAB(19)"7{3 SPACEs}{C
   RSR UP}":GOTO5ØØ                 :REM*94
456 IFV=3THENX=3:PRINTTAB(19)"{SHFT M}{SHFT
    I}{SHFT N}7{CRSR UP}":GOTO5ØØ   :REM*61
5ØØ IFU=2ØTHENY=Ø:PRINTTAB(16)"{SHFT C}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*121
5Ø2 IFU=21THENY=5:PRINTTAB(16)"{SHFT F}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*219
5Ø4 IFU=26THENY=7:PRINTTAB(16)"{SHFT G}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*43
5Ø6 IFU=4THENY=1Ø:PRINTTAB(16)"{SHFT B}B {C
   RSR UP}":GOTO6ØØ                 :REM*213
5Ø8 IFU=18THENY=2:PRINTTAB(16)"{SHFT D}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*111
51Ø IFU=5THENY=3:PRINTTAB(16)"{SHFT E}B {CR
   SR UP}":GOTO6ØØ                  :REM*77
512 IFU=1ØTHENY=9:PRINTTAB(16)"{SHFT A}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*13Ø
514 IFU=6THENY=8:PRINTTAB(16)"{SHFT A}B {CR
   SR UP}":GOTO6ØØ                  :REM*116
516 IFU=14THENY=4:PRINTTAB(16)"{SHFT E}{2 S
   PACEs}{CRSR UP}":GOTO6ØØ         :REM*132
518 IFU=3THENY=1:PRINTTAB(16)"{SHFT D}B {CR
   SR UP}":GOTO6ØØ                  :REM*16
52Ø IFU=28THENY=11:PRINTTAB(16)"{SHFT B}{2
   SPACEs}{CRSR UP}":GOTO6ØØ        :REM*234
522 IFU=48THENY=6:PRINTTAB(16)"{SHFT G}B {C
   RSR UP}":GOTO6ØØ                  :REM*1Ø
525 IFU=62THEN3ØØØ:REM QUIT         :REM*149
53Ø GOTO45Ø                         :REM*54
6ØØ POKEVH(1),A(X,Y):POKEVL(1),B(X,Y):POKEV
   H(2),C(X,Y)                      :REM*36
6Ø2 POKEVL(2),D(X,Y):POKEVH(3),E(X,Y):POKEV
   L(3),F(X,Y)                      :REM*164
61Ø POKEV(1),65:POKEV(2),65:POKEV(3),65
                                    :REM*118
64Ø GOTO45Ø                         :REM*164
1ØØØ Q=INT(Q*2{UP ARROW}(1/12)):RETURN:REM
    CALCULATES NEXT HIGHER DECIMAL:REM*185
2ØØØ POKEVH(1),Ø:POKEVL(1),Ø:POKEVH(2),Ø:PO
    KEVL(2),Ø:POKEVH(3),Ø:POKEVL(3),Ø
                                    :REM*165
2ØØ2 GOTO45Ø                        :REM*251
3ØØØ PRINTCHR$(147):POKE657,Ø:POKE8Ø8,237:P
    OKE198,Ø:PRINTCHR$(142):END     :REM*219
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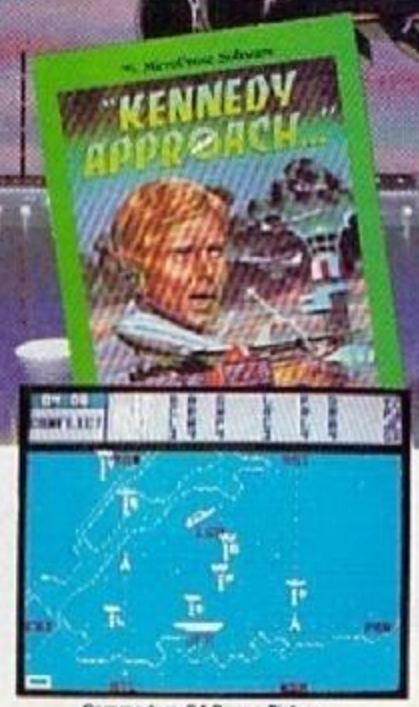

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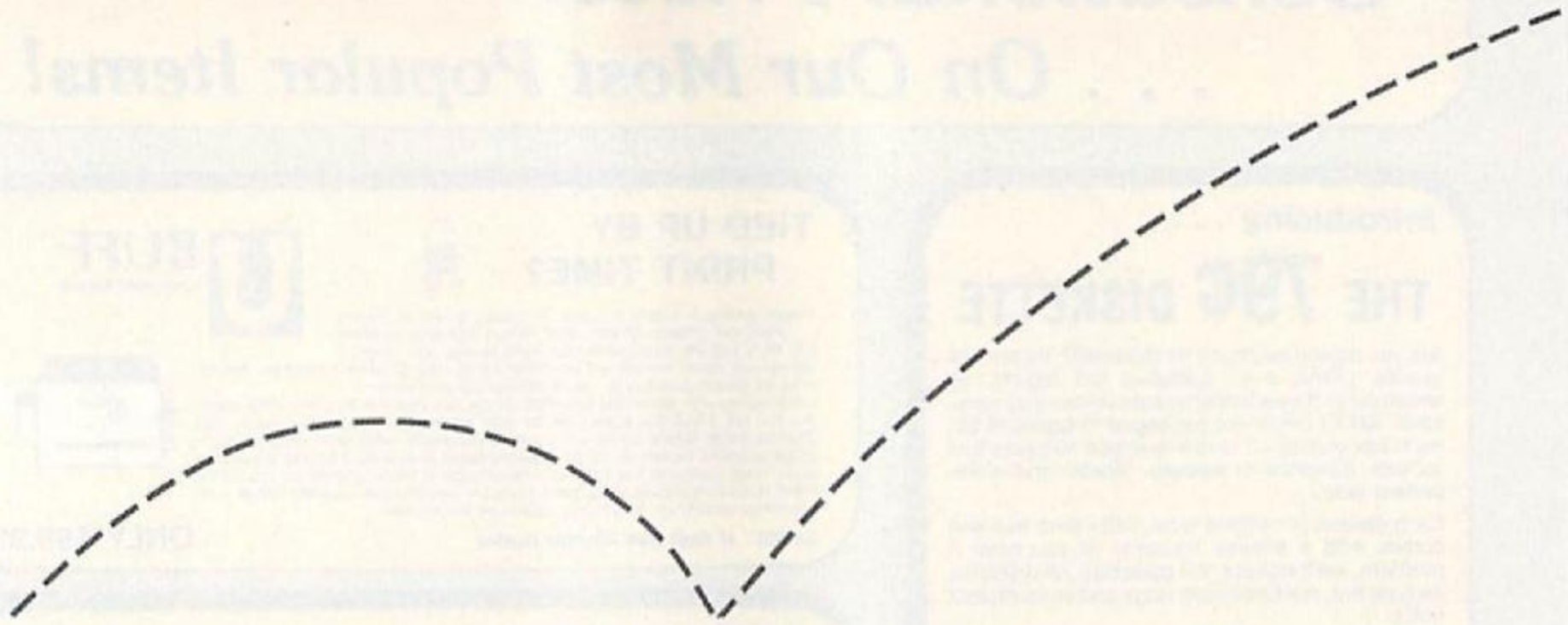

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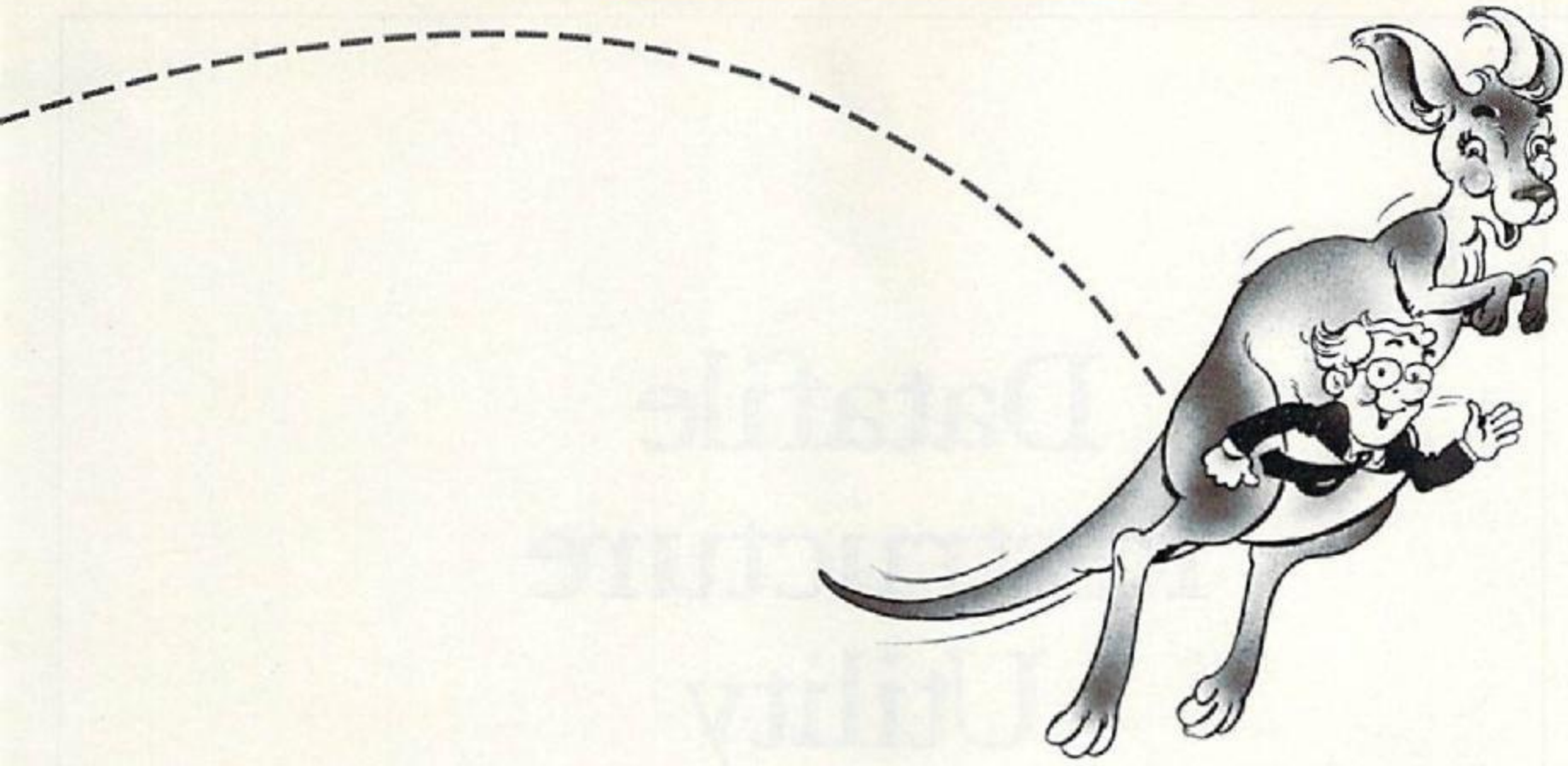

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Datafile Restructure Utility

By MIKE KONSHAK

Once you enter numerous records and create a file with Datafile (*RUN*, November and December 1984), you might discover that you've created a database that does not do the job you intended. Perhaps you acquired new information that doesn't quite fit the original structure, or maybe you no longer deem certain information to be necessary. It's never any fun (and it's definitely a time-waster) when you have to reenter all your data into a new file with a more suitable structure.

The Datafile Restructure program, hereafter called DFRestructure, will solve this problem by allowing you to safely change the structure of existing files created by Datafile and to save the new file under the same or a different name.

The following operations are possible with DFRestructure:

- Change the name or title of a field.
- Change the length of a field.
- Add an additional field.
- Delete an existing field.

Since Datafile is a memory-based, rather than a disk-based, system, storing the records on disk in sequential files, you can alter the field structure—add or delete fields—without destroying all your data.

The number of records that may be held in memory after the creation of a file is dependent on the size and number of the fields within a record. Consequently, when you change the datafile structure (except for a field name change), the number of possible records will be altered. The operations that affect the number of possible records are as follows:

After typing in, say, 35 records, you suddenly realize you forgot to enter an important field. Don't worry. Now you can add, delete or change fields without having to begin from scratch.

- Changing the length of a field—Increasing a field's length or the number of characters within it will decrease the number of possible records. Decreasing the length will increase the number.
- Adding a new field to the structure—This obviously increases the size of each record, since an additional number of characters must be allocated for the new field. This results in less space available for records in memory. However, if you need additional information that is not specified in other fields, this sacrifice of space may be necessary.
- Deleting an existing field—This frees up more memory space, because each record is reduced by the number of characters found in the deleted field. You might choose this feature to eradicate a field you no longer consider important.

Before DFRestructure makes any changes to your datafile, it will recalculate the number of possible records based upon your selection. You will always be given the chance to change your mind before the restructured file is saved to the disk. If the file with the new structure is given a new name, then the original file will be untouched. If the original name is chosen, then the original file will be renamed with !OLD at the end of the filename. This allows you one more chance to recapture that particular datafile and structure.

The restructuring actually occurs during the writing, or saving, of the new file to the disk. As the program reads the structure information, the

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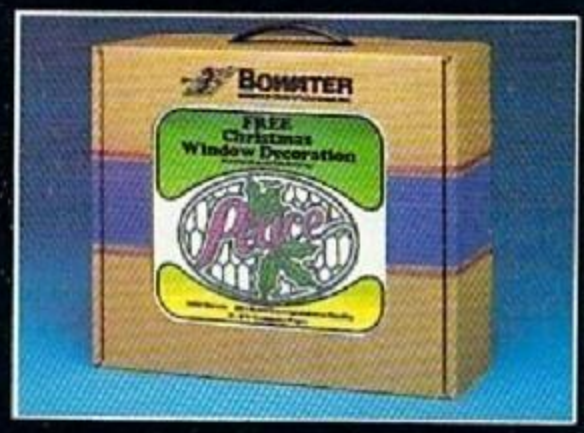

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drive will operate at various times throughout the procedure.

Only one of the four options may be performed at a time, with the modifications being saved to the disk after each process. If the same file is used throughout the operations, you won't have to restart the program. You must start at the beginning if you wish to modify a different file.

The DFRestructure program is really very straightforward and self-explanatory. It uses many prompts and describes the operations when necessary. The structure of the datafile will always be displayed before and after modifications are made, so you'll see the result. If you really want to be cautious, save the new datafile structure on a disk separate from the original. This will further protect your originals.

You may view the final results of your efforts by loading Datafile and reading your new restructured file. It is at this time that you might consider entering the Modify All Records option (if you added an additional field) in order to enter the data that prompted the change.

Note: If the new data you must enter is repetitious (e.g., date, country, zip code, etc.), use the new feature introduced in Datafile 3.1.

Let me explain. If the previously entered record contains the same data in the field you're currently adding or modifying, you may automatically transfer (or clone) that data into the current field by entering the equals sign (=). In other words, the current record field equals the previous record field. When you view the records, you'll see that the transfer was made. This saves considerable typing time.

If you don't want to type in the listings, send me $8 and ask for the "utility disk," which includes DFRestructure, DFCalc and several other programs. R

Address all author correspondence to Mike Konshak, 4821 Harvest Court, Colorado Springs, CO 80917.

Listing 1. *DFRestructure program.*

```
46ØØ REM{2 SPACEs}DATAFILE UTILITY PROGRAM
     DFRESTRUCTURE (C)1985 BY MIKE KONSHAK
                                        :REM*169
46Ø2 POKE5328Ø,7:POKE53281,Ø:PRINT"{CTRL 8}
     ":GOTO462Ø                          :REM*1
46Ø4 REM--GET                           :REM*235
46Ø6 GETA$:IFA$=""THEN46Ø6              :REM*171
46Ø8 RETURN                              :REM*76
461Ø REM--DISK ERROR                     :REM*2
4612 INPUT#15,EN,EM$,ET,ES:IF(EN<2Ø)OR(EN=6
     2)THENET=Ø:RETURN                  :REM*188
4614 PRINT"{CRSR DN} {CTRL 9}{COMD 3}DISK E
     RROR{CTRL Ø}"EN"{CRSR LF}, "EM$","ET"{
     CRSR LF},"ES"{CTRL 8}":ET=8        :REM*23Ø
4616 PRINT"{CRSR DN} PRESS {CTRL 9}ANY KEY{
     CTRL Ø} TO RETURN TO MENU":GOSUB46Ø6:C
     LOSE5:CLOSE15:RETURN               :REM*198
4618 REM----START MENU                  :REM*174
462Ø CLR:PRINT"{SHFT CLR} {CTRL 9}{5 SPACEs
     }DATAFILE RESTRUCTURE PROGRAM{5 SPACEs
     }"                                 :REM*78
4622 PRINT"{CRSR DN} THIS PROGRAM WILL ALTE
     R THE STRUCTURE"                   :REM*9Ø
4624 PRINT" OF A SEQUENTIAL RECORD FILE CRE
     ATED BY"                           :REM*126
4626 PRINT" THE {CTRL 9}DATAFILE{CTRL Ø} DA
     TABASE MANAGEMENT"                 :REM*26
4628 PRINT" SYSTEM, WRITTEN BY MIKE KONSHAK
     ."                                 :REM*226
463Ø PRINT"{CRSR DN} THE FOLLOWING OPTIONS
     ARE POSSIBLE:"                     :REM*12Ø
4632 PRINT"{CRSR DN}{3 SPACEs}*{2 SPACEs}CH
     ANGE THE NAME OF A FIELD"          :REM*2Ø8
4634 PRINT"{3 SPACEs}*{2 SPACEs}CHANGE THE
     LENGTH OF A FIELD"                 :REM*44
4636 PRINT"{3 SPACEs}*{2 SPACEs}ADD A FIELD
      "                                 :REM*26
4638 PRINT"{3 SPACEs}*{2 SPACEs}DELETE A FI
     ELD "                              :REM*182
464Ø PRINT"{CRSR DN} OPTION 2 WILL INCREASE
      OR DECREASE"                      :REM*14
4642 PRINT" THE TOTAL NUMBER OF RECORDS IN
     A FILE."                           :REM*114
4644 PRINT" OPTION 3 WILL DECREASE THE NUMB
     ER OF"                             :REM*24Ø
4646 PRINT" RECORDS AND SOME EXISTING RECOR
     DS MAY"                            :REM*178
4648 PRINT" BE LOST.{2 SPACEs}OPTION 4 WILL
      INCREASE THE"                     :REM*228
465Ø PRINT" TOTAL NUMBER OF RECORDS, ELIMIN
     ATING"                             :REM*124
4652 PRINT" THE DATA FOUND IN THE CHOSEN FI
     ELD."                              :REM*154
4654 PRINT"{2 CRSR DNs} PRESS {CTRL 9}C{CTR
     L Ø}ONTINUE, {CTRL 9}${CTRL Ø} DIRECTO
     RY OR {CTRL 9}Q{CTRL Ø}UIT"        :REM*154
4656 GOSUB46Ø6:IFA$="Q"THENEND          :REM*14Ø
4658 IFA$="$"THENGOSUB4896:GOTO462Ø:REM*176
466Ø IFA$<>"C"THEN4656                   :REM*2Ø
4662 REM----OPEN FILE - READ STRUCTURE
                                        :REM*21Ø
4664 PRINT"{SHFT CLR} {CTRL 9}{7 SPACEs}CHA
     NGE DATAFILE STRUCTURE{6 SPACEs}{CTRL
     Ø}"                                :REM*178
4666 PRINT"{CRSR DN} INSERT A DISK CONTAINI
     NG THE DATAFILE"                   :REM*84
4668 PRINT" FILE TO BE RESTRUCTURED. PRESS
     {CTRL 9}RETURN{CTRL Ø}"            :REM*Ø
467Ø PRINT" WITHOUT AN ENTRY TO EXIT."
                                        :REM*228
4672 INPUT"{CRSR DN} NAME OF DATAFILE ";NF$
     :IFNF$=""THEN4654                  :REM*21Ø
4674 OPEN15,8,15:OPEN5,8,5,"Ø:DF] "+NF$+",S
     ,R":GOSUB4612:IFET=8THEN4654       :REM*226
4676 IFEN=62THENGOSUB4614:GOTO4654      :REM*216
4678 INPUT#5,R,F,X:GOSUB4612:IFET=8THEN4654
                                        :REM*162
468Ø DIM F$(F+2),L%(F+2),REC$(X+1,F+2),K%(X
     +1)                                :REM*78
4682 FORN=1TOF:INPUT#5,F$(N),L%(N):NEXTN:GO
     SUB4612:IFET=8THEN4654             :REM*46
4684 CLOSE5:CLOSE15:GOTO471Ø            :REM*26
4686 REM----PRINT FIELD INFO FOR REFERENCE
                                        :REM*32
4688 PRINT"{SHFT CLR} {CTRL 9}FIELD NAME{LE
     NGTH) FOR {CTRL 2}"+NF$+"{CTRL 8}"
                                        :REM*72
469Ø OE=1:IF(F/2)=INT(F/2)THENOE=Ø      :REM*2Ø4
4692 OF=INT(F/2):FORI=1TOOF+OE          :REM*66
4694 PRINT" {CTRL 9}"I"{CTRL Ø}"F$(I)L%(I);
                                        :REM*25Ø
4696 IFOE=1THEN47ØØ                     :REM*192
4698 PRINTTAB(19)"{CTRL 9}"I+OF"{CTRL Ø}"F$
     (I+OF)L%(I+OF):GOTO47Ø2            :REM*48
47ØØ IFI+OF<FTHENPRINTTAB(19)"{CTRL 9}"I+OF
     +1"{CTRL Ø}"F$(I+OF+1)L%(I+OF+1)
                                        :REM*14
47Ø2 NEXTI:PRINT                        :REM*156
47Ø4 PRINTR"RECORDS ARE POSSIBLE IN FILE"
                                        :REM*98
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Listing 1 continued.

```
47Ø6 PRINTX"RECORDS ARE CURRENTLY PRESENT":
     RETURN                                :REM*146
47Ø8 REM----CHOOSE OPTION                  :REM*224
471Ø GOSUB4688:PRINT"{CRSR DN} CHANGE {CTRL
      9}N{CTRL Ø}AME OF FIELD"             :REM*224
4712 PRINT"{8 SPACEs}{CTRL 9}L{CTRL Ø}ENGTH
      OF FIELD"                            :REM*186
4714 PRINT"{5 SPACEs}OR {CTRL 9}A{CTRL Ø}DD
      ANOTHER FIELD"                       :REM*82
4716 PRINT"{8 SPACEs}{CTRL 9}D{CTRL Ø}ELETE
      A FIELD"                             :REM*216
4718 PRINT"{8 SPACEs}{CTRL 9}${CTRL Ø} DISK
      DIRECTORY"                           :REM*72
472Ø PRINT"{8 SPACEs}{CTRL 9}E{CTRL Ø}XIT T
     O BEGINNING"                          :REM*154
4722 PRINT"{CRSR DN} {CTRL 9}{5 SPACEs}PRES
     S THE APPROPRIATE KEY{8 SPACEs}":REM*2
4724 PRINT"{3 SPACEs}ONLY ONE OPTION MAY BE
      PERFORMED{4 SPACEs}"                 :REM*236
4726 K=Ø:GOSUB46Ø6:IFA$="E"THEN462Ø:REM*186
4728 IFA$="$"THENGOSUB4896:GOTO471Ø:REM*242
473Ø IFA$="N"THENK=1                       :REM*86
4732 IFA$="L"THENK=2                       :REM*1Ø2
4734 IFA$="A"THENK=3                       :REM*242
4736 IFA$="D"THENK=4                       :REM*134
4738 ONKGOTO4742,4754,4766,4778:GOTO4726
                                           :REM*2
474Ø REM----CHANGE FIELD NAME              :REM*134
4742 GOSUB4688:INPUT" CHANGE NAME OF FIELD
     # ? Ø{3 CRSR LFs}";CF:IFCF=<ØTHEN471Ø
                                           :REM*8
4744 IFCF>FTHENPRINT"{CRSR UP}":GOTO4742
                                           :REM*48
4746 PRINT" ENTER NEW FIELD NAME:":PRINT" ?
      ";F$(CF)                             :REM*46
4748 INPUT"{CRSR UP}{CRSR RT}";F$:IFF$=F$(C
     F)THEN471Ø                            :REM*17Ø
475Ø FT=F:GOTO4784                         :REM*198
4752 REM----CHANGE FIELD LENGTH            :REM*52
4754 GOSUB4688:INPUT" CHANGE LENGTH OF FIEL
     D # ? Ø{3 CRSR LFs}";CF:IFCF=<ØTHEN471
     Ø                                     :REM*Ø
4756 IFCF>FTHENPRINT"{CRSR UP}":GOTO4754
                                           :REM*66
4758 PRINT" ENTER NEW FIELD LENGTH:":PRINT"
      ?";L%(CF)                            :REM*11Ø
476Ø INPUT"{CRSR UP}{CRSR RT}";L%:IFL%=L%(C
     F)THEN471Ø                            :REM*66
4762 L%(CF)=L%:FT=F:GOTO4784               :REM*1Ø4
4764 REM----ADD NEW FIELD                  :REM*24Ø
4766 GOSUB4688:PRINT" ADD NEW FIELD #{CTRL
     9}";F+1                               :REM*26
4768 PRINT" {CTRL 9}TITLE OF NEW FIELD":PRI
     NT" ? >":INPUT"{CRSR UP}{CRSR RT}";F$
                                           :REM*128
477Ø PRINT" {CTRL 9}LENGTH OF NEW FIELD":PR
     INT" ? Ø":INPUT"{CRSR UP}{CRSR RT}";L%
                                           :REM*66
4772 IFL%=ØTHEN471Ø                        :REM*182
4774 FT=F+1:CF=F+1:GOTO4784                :REM*18
4776 REM----DELETE EXISTING FIELD          :REM*44
4778 GOSUB4688:INPUT" DELETE WHICH FIELD? Ø
     {3 CRSR LFs}";CF:IFCF=ØTHEN471Ø
                                           :REM*246
478Ø FT=F-1                                :REM*24Ø
4782 REM----CALCULATE # RECORDS            :REM*246
4784 MEM=29293:RL=Ø                        :REM*42
4786 FORJ=ØTOF:IFK=4ANDJ=CFTHEN479Ø:REM*144
4788 RL=RL+L%(J)                           :REM*1Ø8
479Ø NEXTJ:IFK=3THENRL=RL+L%               :REM*12
4792 RL=RL+3*(FT+1)+5                      :REM*7Ø
4794 NR=INT((MEM-12*(FT+1)-21ØØ)/RL)
                                           :REM*136
```

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Listing 1 continued.

```
4796 PRINT"{CRSR DN} YOUR SELECTIONS WILL A
     LLOW APPROX"                    :REM*1ØØ
4798 PRINTNR;"RECORDS.{2 SPACEs}{CTRL 9}A{C
     TRL Ø}CCEPT OR {CTRL 9}R{CTRL Ø}EJECT?
     "                               :REM*8
48ØØ GOSUB46Ø6:IFA$="R"THEN471Ø      :REM*164
48Ø2 IFA$<>"A"THEN48ØØ               :REM*158
48Ø4 REM----LOAD FILE                :REM*238
48Ø6 OPEN15,8,15:OPEN5,8,5,"Ø:DF] "+NF$+",S
     ,R":GOSUB4612:IFET=8THEN471Ø    :REM*174
48Ø8 IFEN=62THENGOSUB4614:GOTO471Ø   :REM*46
481Ø INPUT#5,R,F,X:GOSUB4612:IFET=8THEN471Ø
                                     :REM*16
4812 FORN=1TOF:INPUT#5,F$(N),L%(N):NEXTN:GO
     SUB4612:IFET=8THEN471Ø          :REM*154
4814 FORI=1TOX:PRINT"{CRSR DN} READING RECO
     RD #";I;"{2 CRSR UPs}"          :REM*13Ø
4816 FORN=1TOF:INPUT#5,REC$(I,N):NEXTN:NEXT
     I:PRINT:GOSUB4612:IFET=8THEN471Ø
                                     :REM*1Ø4
4818 FORI=1TOX:PRINT"{CRSR DN} READING POIN
     TERS";I;"{2 CRSR UPs}":INPUT#5,K%(I):N
     EXTI                            :REM*212
482Ø S=ST:IFS<>ØTHEN4824             :REM*62
4822 INPUT#5,E$:GOSUB4612            :REM*178
4824 CLOSE5:CLOSE15                  :REM*18Ø
4826 REM----SAVE RESTRUCTURED FILE   :REM*1Ø6
4828 IFK=1THENF$(CF)=F$              :REM*22
483Ø IFK=2THENL%(CF)=L%              :REM*62
4832 CR$=CHR$(13):PRINT"{SHFT CLR} INSERT T
     HE DISK TO RECEIVE THE FILE."   :REM*64
4834 PRINT" ENTER NAME OF RESTRUCTURED FILE
      TO BE"                         :REM*124
4836 PRINT" SAVED (12 CHARACTERS MAX). IF T
     HE OLD"                         :REM*142
4838 PRINT" FILE NAME IS CHOSEN, THE OLD FI
     LE"                             :REM*142
484Ø PRINT" WILL BE RENAMED WITH !OLD.{2 CR
     SR DNs}"                        :REM*2Ø
4842 PRINT"{2 SPACEs}";NF$:INPUT"{CRSR UP}"
     ;NF$:IFNF$=""THEN471Ø           :REM*138
4844 OPEN15,8,15:PRINT#15,"SØ:DF] "+LEFT$(N
     F$,8)+"!OLD"                    :REM*3Ø
4846 GOSUB4612:IFET=8THEN471Ø        :REM*19Ø
4848 PRINT#15,"RØ:DF] "+LEFT$(NF$,8)+"!OLD=
     DF] "+NF$:GOSUB4612:IFET=8THEN471Ø
                                     :REM*242
485Ø OPEN5,8,5,"Ø:DF] "+NF$+",S,W":GOSUB461
     2:IFET=8THEN471Ø                :REM*194
4852 IFX>NRTHENX=NR                  :REM*2Ø6
4854 PRINT#5,NR;CR$;FT;CR$;X         :REM*2Ø2
4856 FORN=1TOF:IFK=4ANDN=CFTHEN486Ø:REM*198
4858 PRINT#5,F$(N);CR$;L%(N)         :REM*254
486Ø NEXTN:IFK=3THENPRINT#5,F$;CR$;L%
                                     :REM*72
4862 GOSUB4612:IFET=8THEN471Ø        :REM*2Ø6
4864 FORI=1TOX:PRINT"{CRSR DN} SAVING RECOR
     D #";I;"{2 CRSR UPs}"           :REM*73
4866 FORN=1TOF:IFK=4ANDN=CFTHEN487Ø:REM*241
4868 PRINT#5,REC$(K%(I),N)           :REM*155
487Ø NEXTN:IFK=3THENPRINT#5,">"      :REM*15
4872 NEXTI:PRINT:GOSUB4612:IFET=8THEN471Ø
                                     :REM*43
4874 FORI=1TOX:PRINT"{CRSR DN} SAVING POINT
     ERS";I;"{2 CRSR UPs}":PRINT#5,I:NEXTI
                                     :REM*243
4876 PRINT#5,"EOF":GOSUB4612:IFET=8THEN471Ø
                                     :REM*21
4878 CLOSE5:CLOSE15                  :REM*235
488Ø IFX>NRTHENPRINT"THE LAST"X-NR"RECORDS
     WERE DELETED"                   :REM*229
4882 REM--REREAD NEW STRUCTURE       :REM*139
4884 OPEN15,8,15:OPEN5,8,5,"Ø:DF] "+NF$+",S
     ,R":GOSUB4612:IFET=8THEN471Ø    :REM*253
4886 IFEN=62THENGOSUB4614:GOTO471Ø   :REM*125
4888 INPUT#5,R,F,X:GOSUB4612:IFET=8THEN471Ø
                                     :REM*95
489Ø FORN=1TOF:INPUT#5,F$(N),L%(N):NEXTN:GO
     SUB4612:IFET=8THEN471Ø          :REM*233
4892 CLOSE5:CLOSE15:GOTO471Ø         :REM*235
4894 REM--DIRECTORY                  :REM*153
4896 OPEN15,8,15:OPEN5,8,Ø,"$Ø":PRINT"{SHFT
      CLR}":GOSUB4612:IFET=8THENRETURN
                                     :REM*189
4898 GET#5,A1$,A2$                   :REM*237
49ØØ GET#5,A1$,A2$                   :REM*239
49Ø2 GET#5,A1$,A2$                   :REM*241
49Ø4 IFA1$<>""THENAØ=ASC(A1$)        :REM*123
49Ø6 IFA2$<>""THENAØ=AØ+ASC(A2$)*256:REM*79
49Ø8 PRINTMID$(STR$(AØ),2);TAB(3);   :REM*159
491Ø GET#5,A2$:IFST<>ØTHEN4928       :REM*2Ø7
4912 IFA2$<>CHR$(34)THEN491Ø         :REM*47
4914 GET#5,A2$:IFA2$<>CHR$(34)THENPRINT"{CT
     RL 9}"A2$"{CTRL Ø}";:GOTO4914   :REM*83
4916 GET#5,A2$:IFA2$=CHR$(32)THEN4916
                                     :REM*239
4918 PRINTTAB(2Ø);:A3$=""            :REM*129
492Ø A3$=A3$+A2$:GET#5,A2$:IFA2$<>""THEN492
     Ø                               :REM*211
4922 PRINTLEFT$(A3$,3)               :REM*183
4924 GETA$:IFA$<>""THENGOSUB4932     :REM*75
4926 IFST=ØTHEN49ØØ                  :REM*125
4928 PRINT" BLOCKS FREE";:AØ=Ø       :REM*141
493Ø CLOSE5:CLOSE15:PRINTTAB(25)"PRESS {CTR
     L 9}ANY KEY{CTRL Ø}":GOSUB46Ø6:RETURN
                                     :REM*119
4932 GOSUB46Ø6:RETURN                :REM*211
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Brainstorming

Having trouble collecting your thoughts? First get them onto the screen, then let this program help you organize them into a logical outline.

By MARK JORDAN

Do you have a word processor? Then you know how much easier it is to organize your writing. Move a paragraph here, juggle a word there.

Word processing does for writing what the cotton gin did for processing cotton. But word processing still means a lot of thinking and hard work. No matter how smoothly your software picks, sorts and separates those thoughts, it's still up to you to get them planted.

Until now. Enter Brainstorm. Brainstorm is a pre-word processor program; it makes pre-writing almost as much fun as word processing. Brainstorm helps organize your raw, fragmented thoughts into polished, organized groups. The end product is a classical outline, complete with Roman numeral headings, uppercase letter subheadings and Arabic numeral sub-subheadings—just as the English teacher ordered.

As a matter of fact, besides being a freelance writer, I'm an English teacher, and I wrote this program to help my students learn to outline. After it was completed, I found that it improved my own writing.

As a teacher, I know and have always taught that brainstorming and outlining are prerequisites to good writing. In the germination stage of creating, it is best to let the right hemisphere of the brain flow freely. The right brain can't stand to be bogged down with rigid, left-brain standards.

Initially, Brainstorm just asks you to freely express your ideas, unimpeded by logic, convention or whatever standards your left brain imposes. Subsequent stages then help you create an outline of your thoughts.

Brainstorm can also help you program. In the initial stages of programming, you should think through the problem in English phrases and work out the logic at this level before doing actual coding.

Perhaps the greatest value of Brainstorm is that it improves thinking. Clear thinking is really nothing more than sorting and arranging thoughts over and over until a logical structure appears. Brainstorm will help you do that.

Using Brainstorm requires no manual. You just follow the prompts. The REM statements in lines 35–100 reveal the process. First, you type in ideas. I encourage you to be very free in generating your ideas. Do *not* worry about correctness at this point. If, during the input stage, you fret about whether this parallels that or whether you're repeating yourself, you'll lose the right-brain flow. Just be loose and get onto that screen any idea that pops into your mind.

After you've exhausted your ideas, you'll enter the grouping stage. This is simply a presentation of your raw ideas, two at a time. Your task is to decide if the two presented seem similar. This simple comparison test is the beginning of rational thought. Again, don't worry if you made wrong decisions. You'll get a chance to correct them later.

From this point on, your ideas will be presented in groups that you have unwittingly constructed. It's pleasant to discover that your spontaneous ideas, compared only in pairs up to this point, are now grouped; the shadow of an underlying structure is becoming apparent.

You'll be given the chance to move items from group to group, juggle

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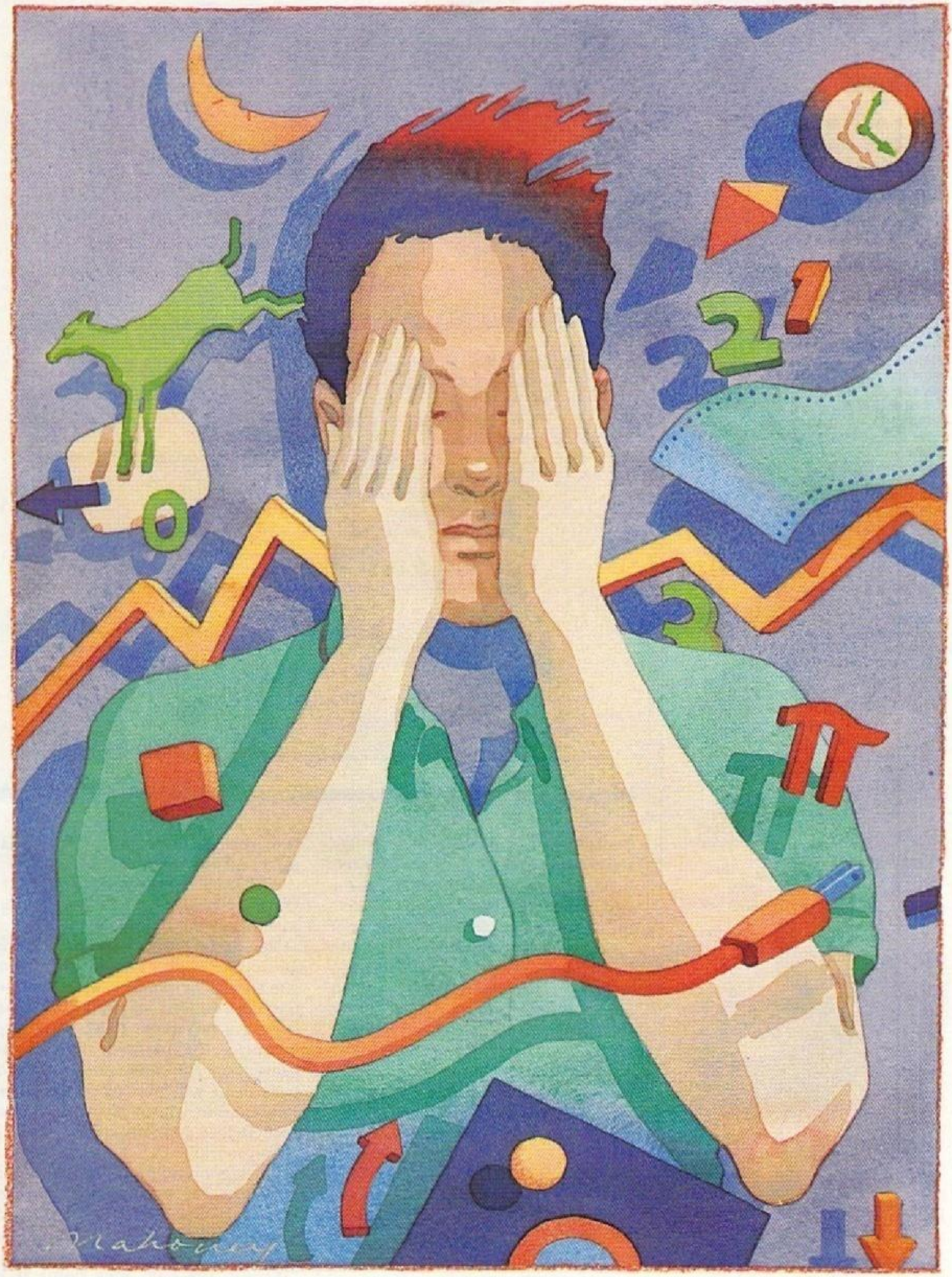

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THESIS: The DJN/R offers services to a broad cross-section of computer users.

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  A. Describe Dow Jones News/Retrieval
  B. What it is
  C. Who it is targeted for
  D. How to subscribe to the DJN/R
  E. How much it costs

II. Services available
  A. What services it has
  B. Financial and business news
  C. CompuStore
  D. Free services
  E. Newsletter
  F. MCI Mail

THESIS: DJN/R offers information services for a wide variety of topics.

I. Describe DJN/R
  A. What it is
    1. When it was developed
    2. Who it was made for originally
  B. Who it is targeted for
    1. Traditionally for people in need of quick financial and business news
    2. Now includes a more general audience
  C. How to subscribe to the DJN/R
    1. Phone call to 800 #
    2. On-line registration
  D. How much it costs
    1. Rate for people with no product deal
    2. Rate for those with a modem or software offering discount deal

II. Services available
  A. Financial and business news
  B. CompuStore
  C. Free services
  D. Newsletter
  E. MCI Mail

Figure 1. *Example of an outline produced by the Brainstorm program.*

items within groups, assign headings, rearrange group order, rephrase headings, subdivide items, view a rough draft halfway through, write a thesis statement that sums up your entire idea or argument and, finally, print your outline.

The prompts will guide you nicely along, but several points bear emphasizing. Foremost, when in doubt, hit the return key. The worst that can happen is you'll jump prematurely into the next level, and you can always go back.

It is also important to use the buffer. Early in the program, you'll be able to extract items from groups and store them in a buffer. Use this feature to rearrange the order of your items, as well as to move items from group to group.

Also, several times in the program you'll be asked if you want to repeat the process. If in doubt, answer yes. It is during these repeat runs that many inconsistencies show up.

And finally, nothing beats practice. Once or twice through Brainstorm will make you an expert.

The end product of Brainstorm is an outline, and, to avoid confusion, you should be familiar with some of the conventions of outlines. First, there are two major types: topic and sentence. Brainstorm's format is geared more towards a topic outline, because it will not accept terminal punctuation within headings unless you enclose your inputs within quotation marks.

Next, good outlines are parallel in structure. This means that headings of equal value (such as all the uppercases within a group) should be similarly worded. Thus, if point A is "What Cows Eat" and point B is "Swill and other Pig Food," it would be better to make B "What Pigs Eat."

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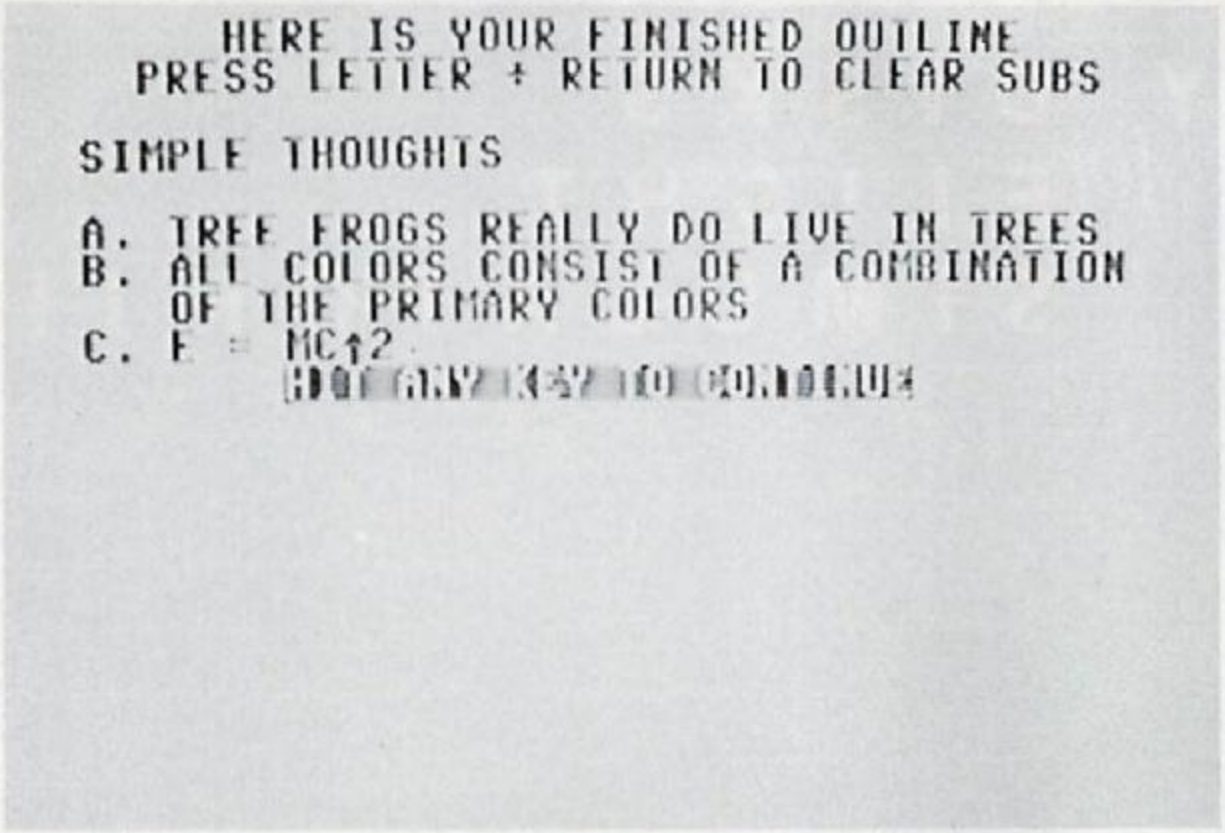
HERE IS YOUR FINISHED OUTLINE
PRESS LETTER + RETURN TO CLEAR SUBS
SIMPLE THOUGHTS
A. TREE FROGS REALLY DO LIVE IN TREES
B. ALL COLORS CONSIST OF A COMBINATION
OF THE PRIMARY COLORS
C. E = MC↑2

Lines 80–90 will guide you in this process.

A third outlining convention that Brainstorm obeys is the rule that you must never have an "A" without a "B" or a "1" without a "2." The subroutine denoted in line 55 follows this rule for the major headings.

Brainstorm's final outlining rule limits you to seven major headings, because an outline with more than seven headings is awkward, difficult to follow and should be condensed.

I've also discovered that Brainstorm doesn't have to quit when the writing process moves into the writing stage. After the initial brainstorming session, I print up my outline and start writing, using it as my guide. Then, as I write, I often discover that my outline could use a little rearranging or some additional points. So, when it feels right, I reload Brainstorm and start again, using my previous outline as a guide. This is extremely helpful in achieving extra-solid logic.

Braving the Storm

I must report a few potential perils associated with Brainstorming. This program uses a lot of Input statements, and there are three tricks to keep in mind when typing in inputs: 1. As previously mentioned, if you wish to include punctuation within the input, enclose your input within quotation marks; 2. Keep your cursor on the line it's already on, as moving it can cause problems (it's okay, however, to type onto the next line or move the cursor within the line); 3. Always end your response by pressing the return key.

Another snare concerns Brainstorm's limitations. First of all, you can't input more than 40 raw ideas. (You could have more by changing G in line 30 to whatever you wish, but doing so slows down the program and I feel it's unlikely you'll ever need more.) Secondly, you can't have more than 15 items within a single group. (Again, you can opt for more by changing LC(15) in line 30 to LC(whatever), but the same advice applies.) Finally, the C-64's somewhat sluggish garbage collection routine; occasionally the program will hang up for ten or 20 seconds or more. Don't panic. Eventually it will be all right.

The only other known quirk relates to the fact that your screen is only showing a 40-column page, while your printer will print in 80 columns. Therefore, when you type long items, a few words might jump down a line and mess up your screen display. Don't worry, however, because everything will look fine on your printout.

I included a string-printing trick in lines 15–20 and in line 975. By defining a string at the top of the program (L$ and SP$) as a series of cursor movements and spaces, then by using the Left$ command with a variable, I was able to do some nifty screen formatting. I suggest you fool around with this technique, as it's a good one.

I wrote this article with a Brainstormed outline before me. The program works well, I assure you. Type it in and try it; you'll love it!

For those who prefer not to type in Brainstorm, send me $3 and a blank cassette or formatted disk with a self-addressed stamped mailer, and I'll send you a copy of the program. R

Address all author correspondence to Mark Jordan, 70284 C.R. 143, Ligonier, IN 46767.

Listing 1. *Brainstorm program.*

```
10 POKE53280,1:POKE53281,1:PRINT"{COMD 3}"
                                        :REM*252
15 DIMZ$(48),D$(11,11):L$="{HOME}{22 CRSR D
   Ns}":LS$="{10 CRSR RTs}"             :REM*115
20 SP$="{40 SPACEs}":DI$="HEADINGS" :REM*12
25 FORT=1TO7:READR$(T):NEXT:FORT=1TO48:READ
   Z$(T):NEXT                           :REM*5
30 N1=18:N2=62:N3=146:G=40:R=1:FT=G:B=0:DIM
   I$(G),ID$(10,G,10),LC(15)            :REM*200
35 GOSUB160 :REM{3 SPACEs}INPUT IDEAS
                                        :REM*129
40 GOSUB180 :REM{3 SPACEs}GROUP IDEAS
                                        :REM*104
45 GOSUB265 :REM{3 SPACEs}REMOVE IDEAS
                                        :REM*121
50 GOSUB310 :REM{3 SPACEs}REPLACE BUFFERED
   ITEMS                                :REM*58
55 GOSUB615 :REM{3 SPACEs}CHECK FOR A WITHO
   UT B                                 :REM*149
60 GOSUB405 :REM{3 SPACEs}HEADINGS :REM*232
65 GOSUB750 :REM{3 SPACEs}REARRANGE HEADING
   S                                    :REM*203
70 GOSUB435 :REM{3 SPACEs}THESIS STATEMENT
                                        :REM*124
75 GOSUB450 :REM{3 SPACEs}ROUGH DRAFT
                                        :REM*129
80 GOSUB495 :REM{3 SPACEs}PICK BEST-WORDED
   ITEM                                 :REM*46
85 GOSUB535 :REM{3 SPACEs}REPHRASE HEADINGS
                                        :REM*93
90 GOSUB570 :REM{3 SPACEs}REPHRASE SUB HEAD
   INGS                                 :REM*212
95 GOSUB685 :REM{3 SPACEs}SUBDIVIDE SUBHEAD
   INGS                                 :REM*83
100 GOSUB855:REM{3 SPACEs}FINAL CHECK THEN
    PRINT                               :REM*170
105 GOTO45                              :REM*133
110 C=64:LIMIT=LC(U)                    :REM*158
115 IFLC(U)=0THENLIMIT=R                 :REM*73
120 FORP=1TOLIMIT:F=1                   :REM*254
```

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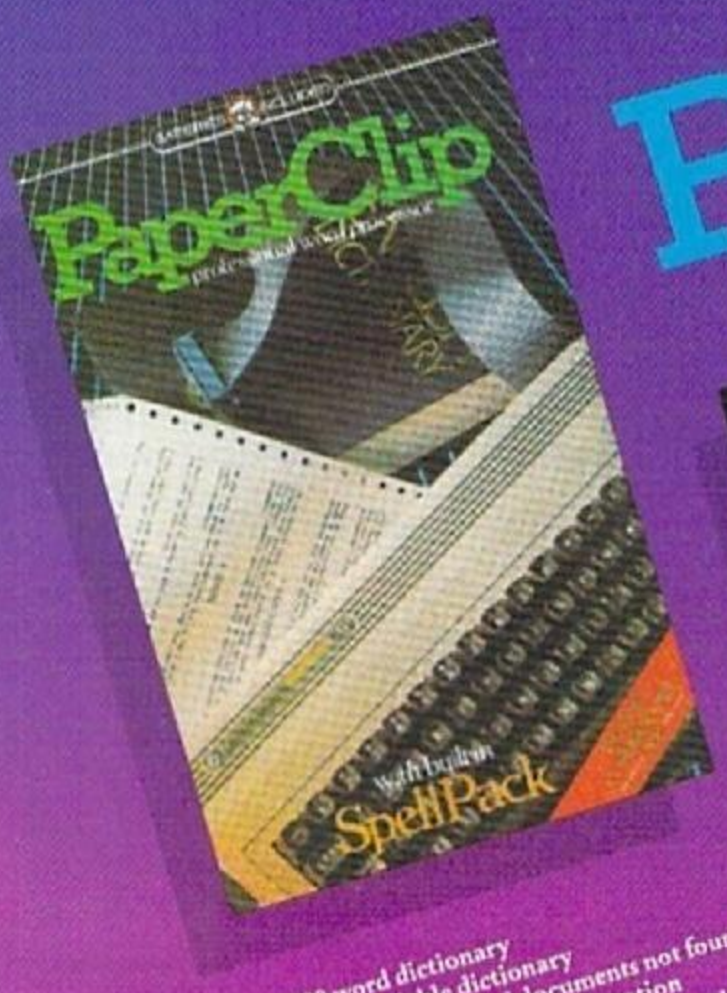

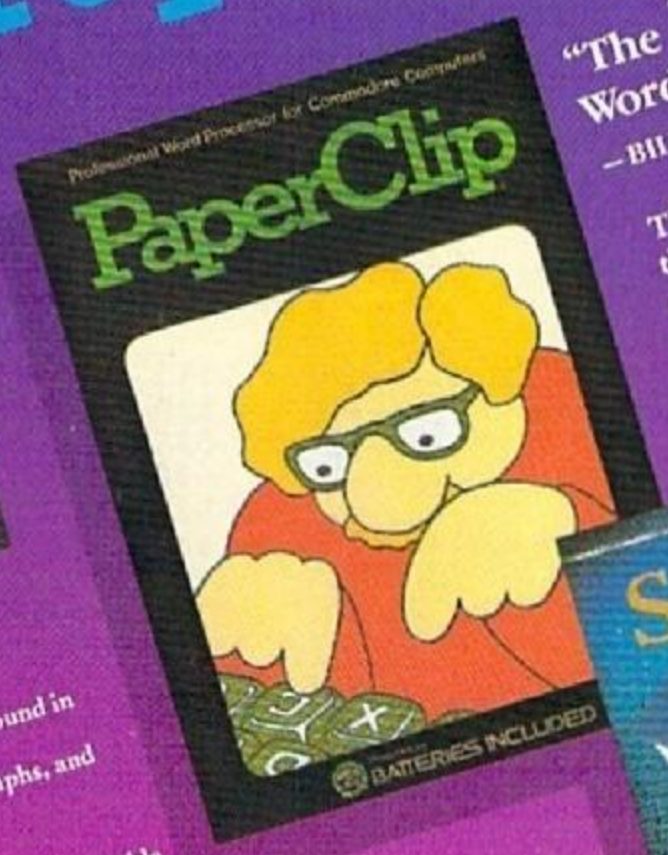

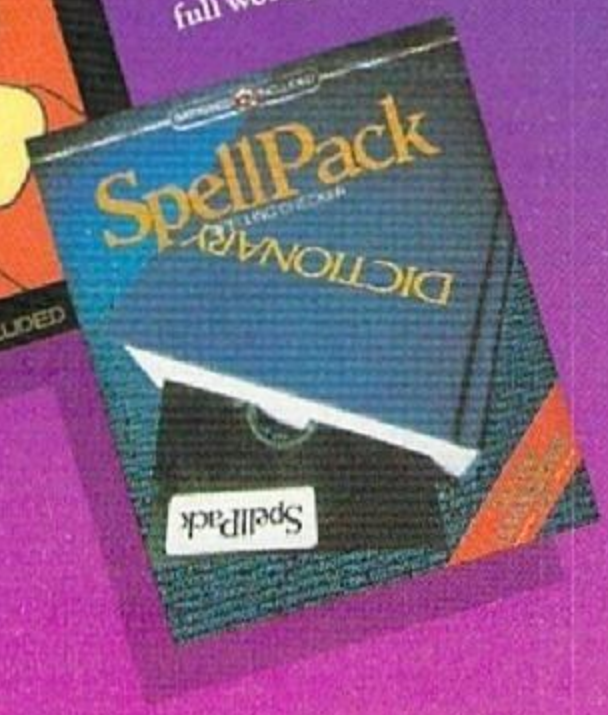

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Listing 1 continued.

```
125 IFID$(U,P,Ø)=""THENFORI=P+1TOLI+1:ID$(U
    ,I-1,Ø)=ID$(U,I,Ø):NEXT          :REM*83
13Ø IFID$(U,P,Ø)=""THEN15Ø           :REM*86
135 C=C+1:PRINTLEFT$(LS$,Ø)CHR$(C)CHR$(N1)C
    HR$(N2)CHR$(N3)ID$(U,P,Ø)        :REM*41
14Ø IFID$(U,P,F)<>""THENPRINTLEFT$(LS$,2)F"
    {CRSR LF}. "ID$(U,P,F):F=F+1:GOTO14Ø
                                     :REM*84
145 NEXT                             :REM*155
15Ø LC(U)=P-1:IFLC(U)>HITHENHI=LC(U):REM*26
155 RETURN                           :REM*213
16Ø Z=1:GOSUB945:Z=2:GOSUB955:Z=4:GOSUB955
                                     :REM*1Ø
165 N=14:GOSUB975                    :REM*223
17Ø INPUT"{2 CRSR UPs}";I$(R):IFI$(R)=""THE
    NRETURN                          :REM*2Ø2
175 R=R+1:GOSUB735:GOTO165           :REM*91
18Ø UC=Ø:Z=5:GOSUB945:Z=6:GOSUB955:Z=7:GOSU
    B95Ø:Z=9:GOSUB95Ø                :REM*32
185 Z=1Ø:GOSUB95Ø:Z=11:GOSUB95Ø      :REM*37
19Ø D=1:C=1:UC=UC+1                  :REM*48
195 IFI$(D)=""THEND=D+1:IFD<GTHEN195:REM*39
2ØØ ID$(UC,1,Ø)=I$(D):N=12:GOSUB975:PRINT"{
    2 CRSR UPs}"I$(D):I$(D)=""       :REM*136
2Ø5 FORT=D+1TOR                      :REM*179
21Ø IFI$(T)=""THEN25Ø                :REM*2Ø6
215 N=15:GOSUB975:PRINT"{2 CRSR UPs}"I$(T)
                                     :REM*255
22Ø GETA$:IFA$="Y"THEN235            :REM*198
225 IFA$="N"THEN245                  :REM*145
23Ø GOTO22Ø                          :REM*2ØØ
235 C=C+1:ID$(UC,C,Ø)=I$(T):I$(T)=""
                                     :REM*161
24Ø IFC>14THENZ=4Ø:GOSUB96Ø:FORT=1TO1ØØØ:NE
    XT:GOTO255                       :REM*6Ø
245 N=14:GOSUB975                    :REM*47
25Ø NEXT                             :REM*4
255 FORK=DTOR:IFI$(K)<>""THEN19Ø     :REM*21
26Ø NEXT:RETURN                      :REM*2Ø1
265 U=Ø:B=1                          :REM*94
27Ø U=U+1:IFU=UC+1THENRETURN         :REM*243
275 Z=Ø:Z$(Ø)=Z$(14)+STR$(U):GOSUB945:GOSUB
    11Ø                              :REM*1ØØ
28Ø Z=15:GOSUB955:Z=16:GOSUB95Ø:Z=12:GOSUB9
    5Ø                               :REM*37
285 GETA$:A=ASC(A$+CHR$(Ø))          :REM*96
29Ø IFA=13THEN27Ø                    :REM*173
295 IFA<65ORA>CTHEN285               :REM*116
3ØØ ID$(UC+1,B,Ø)=ID$(U,A-64,Ø):B=B+1:LC(UC
    +1)=LC(UC+1)+1                   :REM*189
3Ø5 ID$(U,A-64,Ø)="":ID$(U,A-64,1)="":GOTO2
    75                               :REM*16
31Ø UU=1                             :REM*137
315 IFB$="+"THENRETURN               :REM*222
32Ø U=UC+1:Z=19:GOSUB945:GOSUB11Ø:CC=C
                                     :REM*79
325 Z=Ø:Z$(Ø)=Z$(14)+STR$(UU):GOSUB955
                                     :REM*1Ø8
33Ø U=UU:GOSUB11Ø:Z$(Ø)=Z$(2Ø)+STR$(U):GOSU
    B955:Z=16:GOSUB95Ø:Z=3:GOSUB955:REM*245
335 GETA$:A=ASC(A$+CHR$(Ø))          :REM*146
34Ø IFA=13THEN37Ø                    :REM*225
345 IFA=136THEN365                   :REM*92
35Ø IFA=45THENID$(UU,1,Ø)="":RETURN:REM*181
355 IFA<65ORA>CCTHEN335              :REM*88
36Ø ID$(UU,P,Ø)=ID$(UC+1,A-64,Ø):ID$(UC+1,A
    -64,Ø)="":LC(U)=LC(U)+1:GOTO315:REM*191
365 INPUT"{2 CRSR DNs}";I$:ID$(UU,P,Ø)=I$:R
    =R+1:LC(U)=LC(U)+1:GOSUB735:GOTO315
                                     :REM*182
37Ø UU=UU+1:IFUU<>UC+1THEN315        :REM*153
375 Z=21:GOSUB945:Z=22:GOSUB95Ø:Z=47:GOSUB9
    7Ø                               :REM*156
38Ø FORT=1TOLC(UC+1):ID$(UC+1,T,Ø)="":NEXT
                                     :REM*111
385 GETA$:IFA$=""THEN385             :REM*2Ø2
39Ø IFA$="{LEFT ARROW}"THEN45        :REM*123
395 IFA$="+"THENU=UC:UC=UC+1:GOTO315
                                     :REM*116
4ØØ RETURN                           :REM*2Ø3
4Ø5 FORT=1TOLC(UC+1):ID$(UC+1,T,Ø)="":NEXT:
    Z=23:GOSUB945:U=1                :REM*17Ø
41Ø Z=Ø:Z$(Z)=Z$(28)+STR$(U):GOSUB955:PRINT
    :GOSUB11Ø                        :REM*223
415 INPUT"{CRSR DN}HEADING";ID$(U,Ø,Ø)
                                     :REM*116
42Ø IFID$(U,Ø,Ø)=""THENID$(U,Ø,Ø)="(NO HEAD
    ING)"                            :REM*165
425 U=U+1:IFU=UC+1THENRETURN         :REM*142
43Ø GOTO41Ø                          :REM*145
435 Z=46:GOSUB945:Z=45:GOSUB95Ø      :REM*23Ø
44Ø INPUT"{2 CRSR DNs}";THESIS$:IFTH$=""THE
    NTH$=T$                          :REM*13
445 T$=TH$:RETURN                    :REM*1ØØ
45Ø Z=25:GOSUB945                    :REM*87
455 Z=Ø:Z$(Z)=TH$:GOSUB955           :REM*2ØØ
46Ø U=1:N1=27:N2=46:N3=32            :REM*145
465 PRINT"{CRSR DN}"ID$(U,Ø,Ø)"{CRSR DN}":G
    OSUB11Ø                          :REM*1Ø6
47Ø U=U+1                            :REM*187
475 Z=35:GOSUB965                    :REM*132
48Ø GETA$:IFA$=""THEN48Ø             :REM*199
485 IFU=UC+1THENRETURN               :REM*118
49Ø GOTO465                          :REM*189
495 E=Ø                              :REM*16Ø
5ØØ Z$(Ø)=Z$(8)+" "+DI$:Z=Ø:GOSUB945:Z=27:G
    OSUB95Ø:Z=44:FT=42:GOSUB955      :REM*49
5Ø5 IFDI$="ITEMS"THENE=E+1:U=E:PRINT"{CRSR
    DN}"ID$(E,Ø,Ø)"{CRSR DN}":GOSUB11Ø:GOTO
    515                              :REM*1Ø
51Ø FORU=1TOUC:PRINT"{CRSR DN}"CHR$(U+64)".
     "ID$(U,Ø,Ø):NEXT                :REM*91
515 GETA$:IFA$=""THEN515             :REM*2Ø3
52Ø IFA$=CHR$(13)THENA=Ø:GOTO53Ø     :REM*48
525 A=ASC(A$)-64:IFA<ØTHENA=Ø        :REM*219
53Ø RETURN                           :REM*78
535 IFA=ØTHENRETURN                  :REM*181
54Ø Z=31:GOSUB945:Z=32:GOSUB95Ø:PRINT:Z=Ø:Z
    $(Z)=ID$(A,Ø,Ø)+" ":GOSUB965     :REM*19Ø
545 Z=44:FT=42:GOSUB955              :REM*47
55Ø FORY=1TOUC:IFID$(A,Ø,Ø)=ID$(Y,Ø,Ø)THEN5
    65                               :REM*212
555 N=12:GOSUB975:PRINT"{2 CRSR UPs}"ID$(Y,
    Ø,Ø)                             :REM*237
56Ø INPUT"{CRSR DN}CHANGE TO";ID$(Y,Ø,Ø):N=
    15:GOSUB975                      :REM*21Ø
565 NEXT:RETURN                      :REM*251
57Ø DI$="ITEMS":GOSUB5ØØ:IFA=ØTHEN6Ø5
                                     :REM*25Ø
575 Z=24:GOSUB945:Z=32:GOSUB95Ø:PRINT:Z=Ø:Z
    $(Z)="{CTRL 9}"+ID$(E,A,Ø):GOSUB965
                                     :REM*2Ø3
58Ø Z=44:FT=42:GOSUB955              :REM*82
585 FORY=1TOP-1:IFID$(E,A,Ø)=ID$(E,Y,Ø)THEN
    6ØØ                              :REM*11
59Ø N=12:GOSUB975:PRINT"{2 CRSR UPs}"ID$(E,
    Y,Ø)                             :REM*32
595 INPUT"{CRSR DN}CHANGE TO";ID$(E,Y,Ø):N=
    15:GOSUB975                      :REM*253
6ØØ NEXT                             :REM*1ØØ
6Ø5 IFE=UCTHENRETURN                 :REM*191
61Ø GOTO57Ø                          :REM*174
615 U=Ø:N=Ø                          :REM*191
62Ø U=U+1:IFU>UCTHENRETURN           :REM*226
625 IFID$(U,1,Ø)=""THEN665           :REM*63
63Ø IFID$(U,2,Ø)=""THEN64Ø           :REM*22
635 GOTO62Ø                          :REM*127
64Ø Z=34:GOSUB945:Z=Ø:Z$(Z)=Z$(28)+STR$(U)+
    " "+Z$(36):GOSUB955              :REM*156
645 Z=37:GOSUB955:Z=38:GOSUB955:GOSUB11Ø
                                     :REM*49
65Ø GETB$:IFB$="{LEFT ARROW}"THEN665
                                     :REM*18Ø
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SUPER GRAPHIX printer interface w/8K buffer, and down loadable character fonts. Simply the best interface made..... $ lowest price

SUPERGRAPHIX jr printer interface..$46.95

FONT MASTER..$24.95

RGBi/Composite Monitors Alternatives to the 1902

Technica MJ-22	$269.00
Panasonic 1300	$CALL
RGBi Cable	$19.95
Composite Video Cable	$6.95

PRINTER PACKAGE MANIA!

all packages work with C64 or C128

Star SG-10 & XETEC SUPERGRAPHIX ..$274.95

SG-10 & Xetec Supergraphix jr	$254.95
SG-10 & Cardco G-Wiz	$264.96
SG-10 & MW-350	$275.95
SG-15 & Xetec Supergraphix	$419.95
SG-15 & Cardco G-Wiz	$412.95
SD-10 & Xetec Supergraphix	$384.95

PANASONIC

1091 & Xetec Supergraphix	$289.95
1091 & Cardco G-Wiz	$285.95

EPSON

LX-80 & Xetec Supergraphix	$274.95
LX-80 & Cardco G-Wiz	$269.95
FX-85 & Xetec Supergraphix	$387.95
FX-185 & Xetec Supergraphix	$529.95

COMMODORE 128 SOFTWARE

WORDPRO 128 from Proline. Written by Steve Punter, author of best sellers Wordpro 3 + /64, Wordpro 64. Uses 80 columns, fast drives! list $99.95 ..... OUR PRICE $89.95

JANE	$32.95
Perfect Calc	$42.95
Perfect Writer	$CALL
Perfect Filer	$CALL
Vizastar 128	$CALL

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Broderbund Print Shop	$25.95
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120 sheet color paper refill ⅓ red, ⅓ blue, ⅓ gold	$8.95

SG-10	$CALL
SG-10C Commodore ready	$236
SG-15	$364
SD-10	$323
SD-15	$449
POWERTYPE.. 18cps daisywheel	$299
SR-10, SR-15	$CALL

Star micronics inc

PRO-LINE SOFTWARE

GT 4, fast load/fast save disk basic/cartridge for C-64	$29.95
C POWER	
C COMPILER	$69.99
CADPIC	$36.95
CASHBOX	$36.95
Wordpro 64	$36.95
Spellpro 64	$32.95
Mailpro 64	$24.95
Profile 64	$36.95
PAL 64	$32.95
POWER 64	$32.95
TOOLBOX 64	$69.95

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TOTAL TELEMODEM	$29.95
MASTER MODEM includes Compuserve, Dow Jones time	$39.95
1660	$49.95
WESTRIDGE AUTO	$59.95
MITEY MO	$59.95
MPP 1064	$64.95
VIP TERMINAL	$29.95
VIDTEX TERMINAL	$23.95
COMPUSERVE STARTER KIT	$19.95

EPSON

LX-80	$219.00
LX-80 tractorfeed	$ 34.95
Homewriter 10 includes Commodore or Atari interface	$246.95
FX-85	$323.95
FX-185	$469.00

MONTHLY SPECIALS

PRICES EXPIRE 12/31/85

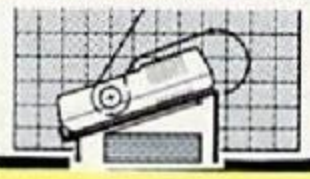
Indus GT	$199.00
Vizastar 8K	$ 79.95
Compuserve Starter Kit	$ 19.95
Amaray Mediamate 5 or Innovative Concepts DataCase each holds 50 disks Your choice	$9.95 EACH

MIRAGE CONCEPTS

Database Manager with Report Generator	$36.99
Prof. Wordprocessor	$36.99
Database Manager, Prof. WP Package	$67.95

KENSINGTON

STAND $19.95
w/any printer.... $14.95



HUSH 80 CD $74.95

Commodore ready thermal printer

PANASONIC

1091	$229.00
1090	$186.95
1092	$349.00
1093	$CALL

DISKOUNT DISKS!!

Bonus Disks (10)
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Maxell (10)
ss/dd .. **$13.95** dd/dd .. $CALL
Centech colored disks (10)
ss/dd .. **$9.45** dd/dd .. $11.95
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Zenith 12" Amber	$ 77.95
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NEC 12" Green	$ 69.95
Cable for monitors	$ 6.95

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Cardco LQI	$249
Riteman LQ	$239
Epson DX-10	$229
Epson DX-20	$309
Star Powertype	$299

PRINTER INTERFACES

Cardco ?/G	$47.95
Cardco G Wiz	$CALL
Tymac Connection	$67.95
MW-350	$CALL
MW-350 buffer	$20.00
Grapler CD	$87.95

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Shipping: $2.50 for software and accessories/$10.00 for printers and color monitors/$8.00 for disk drives and other monitors/ Add $3.00 per box shipped COD. Call for other shipping charges. Additional shipping required on APO, FPO, AK, HI, and foreign orders.

Terms: ALL PRICES REFLECT CASH DISCOUNT, ADD 3% FOR MASTERCARD OR VISA. Manufacturer's warranty honored with copy of our invoice. **ALL SALES ARE FINAL.** Defective items replaced or repaired at our discretion. Pennsylvania residents add 6% sales tax. Prices and terms subject to change without notice.

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Listing 1 continued.

```
655 IFB$="+"THENUU=U:K=U:LC(U)=LC(U)+1:GOSU
    B325:U=K:GOTO62Ø                    :REM*231
66Ø GOTO65Ø                             :REM*2ØØ
665 M=U                                 :REM*189
67Ø FORT=1TOHI:ID$(M,T,Ø)=ID$(M+1,T,Ø):ID$(
    M+1,T,Ø)="":NEXT                    :REM*212
675 LC(M)=LC(M+1):M=M+1:IFM=>UCTHENUC=UC-1:
    GOTO62Ø                             :REM*143
68Ø GOTO67Ø                             :REM*252
685 U=1                                 :REM*175
69Ø Z=39:GOSUB945:PRINT"{CRSR UP}";:Z=43:GO
    SUB95Ø:Z=44:FT=42:GOSUB955          :REM*12
695 E=Ø:PRINT"{CRSR DN}"ID$(U,Ø,Ø)"{CRSR DN
    }":GOSUB11Ø                         :REM*45
7ØØ GETA$:A=ASC(A$+CHR$(Ø)):IFA=13THEN725
                                        :REM*28
7Ø5 IFA<65ORA>P+64THEN7ØØ               :REM*225
71Ø PRINT"{CRSR DN}"ID$(U,A-64,Ø)"{CRSR DN}
                                        :REM*188
715 E=E+1:INPUTI$:IFI$=""THENID$(U,A-64,E)=
    "":GOTO69Ø                          :REM*233
72Ø ID$(U,A-64,E)=I$:I$="":GOTO715      :REM*238
725 IFU<UCTHENU=U+1:GOTO69Ø             :REM*21
73Ø RETURN                              :REM*22
735 IFR<35THEN745                       :REM*217
74Ø PRINT"{CTRL 9}{2 SPACEs}WARNING:{2 SPAC
    Es}ONLY "G-R"{CRSR LF}{2 SPACEs}MORE ID
    EAS ALLOWED {2 CRSR UPs}":FORS=1TO2ØØØ:
    NEXT                                :REM*68
745 RETURN                              :REM*37
75Ø U=1:ZZ=18                           :REM*24Ø
755 Z=13:GOSUB945:Z=17:GOSUB955:Z=12:GOSUB9
    5Ø                                  :REM*143
76Ø GETA$:IFA$="{LEFT ARROW}"THEN775:REM*88
765 IFA$<>""THEN85Ø                     :REM*1Ø9
77Ø GOTO76Ø                             :REM*79
775 FORT=1TOUC:PRINTT" - "ID$(T,Ø,Ø):NEXT
                                        :REM*92
78Ø Z=ZZ:GOSUB955:ZZ=29                 :REM*145
785 GETA$:A=(ASC(A$+CHR$(Ø)))-48:IFA$=""THE
    N785                                :REM*116
79Ø IFA<1ORA>9THEN785                   :REM*37
795 IFU<=UCANDID$(A,Ø,Ø)=""THEN785      :REM*24
8ØØ X$(U)=ID$(A,Ø,Ø):ID$(A,Ø,Ø)=""      :REM*61
8Ø5 FORT=1TOLC(A):D$(U,T)=ID$(A,T,Ø):W=1
                                        :REM*18
81Ø IFID$(A,T,W)<>""THENY$(U,T,W)=ID$(A,T,W
    ):W=W+1:GOTO81Ø                     :REM*233
815 NEXT:L(U)=LC(A):ID$(U,T,Ø)=""       :REM*56
82Ø U=U+1:IFU>UCTHEN83Ø                 :REM*223
825 FORT=1TOU:PRINTX$(T):NEXT:PRINT"{2 CRSR
     DNs}":GOTO775                      :REM*54
83Ø U=1:FORT=1TOUC:ID$(T,Ø,Ø)=X$(T):X$(T)="
    ":LC(T)=L(T):NEXT                   :REM*235
835 FORT=1TOL(U):ID$(U,T,Ø)=D$(U,T):W=1:ID$
    (U,T,1)=""                          :REM*144
84Ø IFY$(U,T,W)<>""THENID$(U,T,W)=Y$(U,T,W)
    :W=W+1:GOTO84Ø                      :REM*91
845 NEXT:ID$(U,T-1,W)="":U=U+1:IFU<=UCTHEN8
    35                                  :REM*6
85Ø RETURN                              :REM*143
855 Z=26:GOSUB945:Z=43:GOSUB95Ø         :REM*1Ø8
86Ø GOSUB46Ø:PRINT"{2 CRSR DNs}":Z=21:GOSUB
    97Ø:Z=42:GOSUB97Ø:Z=41:GOSUB95Ø     :REM*13
865 GETB$:IFB$="{LEFT ARROW}"THENDI$="HEADI
    NGS":RETURN                         :REM*154
87Ø IFB$="P"THEN88Ø                      :REM*9
875 GOTO865                             :REM*96
88Ø OPEN3,4:CMD3                        :REM*99
885 A=1:B=1:PRINT"THESIS:{2 SPACEs}"TH$:PRI
    NT:PRINT                            :REM*136
89Ø C=1:PRINTR$(A)"{2 SPACEs}"ID$(A,Ø,Ø):PR
    INT                                 :REM*167
895 PRINT"{6 SPACEs}"CHR$(B+64)".{2 SPACEs}
    "ID$(A,B,Ø):PRINT                   :REM*232
9ØØ IFID$(A,B,C)=""THEN91Ø              :REM*2Ø5
9Ø5 PRINT,CHR$(C+48)".{2 SPACEs}"ID$(A,B,C)
    :C=C+1:GOTO9ØØ                      :REM*96
91Ø IFC>1THENPRINT:C=1                  :REM*229
915 B=B+1:IFID$(A,B,Ø)<>""THEN895       :REM*76
92Ø A=A+1:B=1:IFID$(A,B,Ø)<>""THENPRINT:GOT
    O89Ø                                :REM*93
925 PRINT#3,:CLOSE3:Z=48:GOSUB945       :REM*44
93Ø GETA$:IFA$="Y"THENRETURN            :REM*215
935 IFA$="N"THENEND                     :REM*158
94Ø GOTO93Ø                             :REM*217
945 PRINT"{SHFT CLR}";                  :REM*12Ø
95Ø L=FT-(LEN(Z$(Z))):FORT=1TOL/2:PRINT" ";
    :NEXT:PRINTZ$(Z):FT=4Ø:RETURN       :REM*2Ø5
955 PRINT"{CRSR DN}";:GOTO95Ø           :REM*2Ø2
96Ø PRINT"{CTRL 9}";:GOTO95Ø            :REM*223
965 Z$(Z)="{CTRL 9}"+Z$(Z):GOTO95Ø       :REM*52
97Ø FT=42:GOTO95Ø                       :REM*55
975 PRINTLEFT$(L$,N)SP$+SP$;:RETURN:REM*164
98Ø DATA "{2 SPACEs}I.","  II.","III.","  IV.
    ","{2 SPACEs}V.","  VI.","VII."    :REM*169
985 DATA"{CTRL 9} BRAINSTORM ",TYPE ANY IDE
    A THAT COMES TO MIND                :REM*23Ø
99Ø DATA "TO ADD AN ITEM TYPE {CTRL 9} F-7
    "                                   :REM*1Ø9
995 DATA BUT LIMIT EACH TO TWO SCREEN LINES
    ,NOW YOU MUST GROUP YOUR IDEAS      :REM*88
1ØØØ DATA THE COMPUTER WILL PRESENT THEM,TW
     O AT A TIME,NEXT REPHRASE YOUR:REM*171
1ØØ5 DATA IF YOU AGREE THAT THE TWO ARE SIM
     ILAR,"PRESS {CTRL 9} Y {CTRL Ø}"
                                        :REM*166
1Ø1Ø DATA "IF NOT, PRESS {CTRL 9} N {CTRL Ø
     }","OTHERWISE PRESS {CTRL 9} RETURN ",
     TO RESEQUENCE                      :REM*95
1Ø15 DATA HERE IS GROUP,TO REMOVE ANY ITEMS
      FROM THIS GROUP,TYPE ITS LETTER
                                        :REM*214
1Ø2Ø DATA "TYPE {CTRL 9} {LEFT ARROW} {CTRL
     Ø}",WHICH ONE FIRST?               :REM*173
1Ø25 DATA YOU REMOVED (BUFFERED) THESE ITEM
     S,TO MOVE BUFFERED ITEMS TO GROUP
                                        :REM*249
1Ø3Ø DATA "TO REARRANGE GROUPS FURTHER TYPE
      {CTRL 9} {LEFT ARROW} ",OTHERWISE HIT
     ANY KEY                            :REM*96
1Ø35 DATA NOW YOU MUST GIVE EACH GROUP A HE
     ADING,MAKE THE OTHER SUBHEADINGS
                                        :REM*53
1Ø4Ø DATA HERE IS A ROUGH-DRAFT OF YOUR OUT
     LINE,HERE IS YOUR FINISHED OUTLINE
                                        :REM*6Ø
1Ø45 DATA TYPE THE LETTER OF YOUR BEST-WORD
     ED ONE,GROUP,WHICH ONE NEXT?,      :REM*45
1Ø5Ø DATA NOW TRY TO MAKE EACH OTHER HEADIN
     G,PARALLEL TO THIS ONE,            :REM*82
1Ø55 DATA EACH GROUP MUST HAVE A 'B' FOR EA
     CH 'A',HIT ANY KEY TO CONTINUE:REM*2Ø9
1Ø6Ø DATA LACKS ONE,"TO ADD ONE TYPE {CTRL
     9} + ","TO DELETE TYPE{2 SPACEs}{CTRL
     9} {LEFT ARROW} "                  :REM*146
1Ø65 DATA "{CRSR LF}TO SUBDIVIDE TYPE THE L
     ETTER OF THE ITEM"                 :REM*229
1Ø7Ø DATA THIS GROUP FULL - NO MORE ITEMS A
     LLOWED,(TURN ON PRINTER)           :REM*236
1Ø75 DATA "PRESS {CTRL 9} P {CTRL Ø} TO PRI
     NT IT",PRESS LETTER + RETURN TO CLEAR
     SUBS                               :REM*215
1Ø8Ø DATA "(PRESS {CTRL 9} RETURN {CTRL Ø}
     TO LEAVE UNCHANGED)",THAT SUMS{2 SPACE
     s}UP YOUR IDEA                     :REM*226
1Ø85 DATA NOW TYPE ONE SENTENCE,"PRESS {CTR
     L 9} + {CTRL Ø} TO ADD A NEW GROUP",RE
     VISE?{2 SPACEs}Y/N                 :REM*211
```

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Solo Flight $21.50
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$19.95

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FLEET SYSTEM 2
Great Buy $48

Special of the Month
Paper Clip $49
Paper Clip/Speller $64
Home Pak $33

BEST SELLERS

1. Summer Games $25
2. HitchHikers Guide $23
3. Typing Tutor III $25
4. Karateka $19
5. Mind Prober $25
6. Spell It $37
7. S'more Basic Rom $49.95
8. Sargon III $32
9. Decision in Desert $25
10. Home Accountant $42

DATA BASES

PFS: File $39
Super Base 64 ..... $48

Special of the Month
The Consultant
$49

SPREAD SHEET

Multiplan $59
Homepak $34

Hardware

C-128 ..... $297
1571 Disk Drive $259
1902 Monitor $309

Holiday Special
C-128 Computer
& 1571 Disk Drive
$549 GREAT BUY!

Commodore 64 ..... $139
1530 Datasette $39
1541 Disk Drive $174
1660 Auto Modem $52
1702 Color Monitor $164

C-1902 Monitor
$299

Special of the Month
MSD DISK DRIVE
SD1 Disk Drive $209
SD2 Disk Drive $439

INDUS GT
DISK DRIVE
$219

COMPUSERVE STARTER
KIT $21

Great Gift
1541 FLASH
$54.95

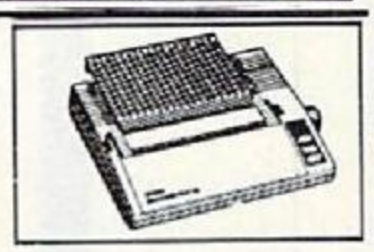
CARDCO 5 SLOT
EXPANDER
$49.95

SG-10 $209

SG-10C $229
SG-15 ..... $359
SD-10 ..... $329
SD-15 ..... $444
SR-10 ..... $479
SR-15 ..... $579
Gemini 10x Ribbon $3

Printers

RX-80 ..... $218
Homewriter 10 .... $209
NEW LX-80 ..... $210
FX-85 ..... $329
FX-185 ..... $459
DX-10 Daisywheel ... $245



PANASONIC

1091 ..... $232
1090 ..... $185
1092 ..... $374
1093 ..... $425

Okidata 182 ..... $214
Okidata 192 ..... $349
Okidata 193 ..... $499

MPS 801 Printer
$119 Reg. $199

SMITH CORONA

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Matrix
Printer
$149

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Espon MX 80 .... $7.99
Espon MX 80 FT $7.99
Okidata 92 ..... $7.99

Special Offer

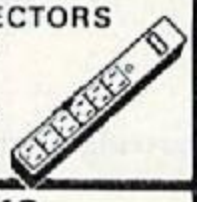
MW-350 ..... $69
4K Buffer $19

PRINTER INTERFACES

Datashare PPI $41
Tymac Connection $54
Cardco + G Wiz $54
MW 302 ..... $39
Grappler CD $84

SURGE PROTECTORS

1 Outlet $14
SPECIAL
4 Outlet $24
6 Outlet $28



RIBBONS

Epson MX-80 ..... $5
Epson M/Rx-100 ..... $8
SG-10 ..... $3
SG-15 ..... $3

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Maxell SS/DD $15.99
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HARDWARE BUYER'S GUIDE

This is the second annual Hardware Buyer's Guide. The guide contains the peripherals and accessories released in 1985 that you can add to your Commodore computer. The information contained herein was taken from a questionnaire sent to manufacturers of Commodore products. The response to the questionnaire forms the basis of this guide. We are not responsible for any omissions or misinformation contained in this guide.

Find Out What's Available for Your Commodore

Analog-to-Digital Converters

ADL-6412 A/D Converter
A 16-input, 12-bit analog-to-digital converter that connects to the computer through the expansion port; software on tape and disk also available. $189
Technical Hardware, Inc.

Analog/Digital Converter
Allows eight channels of ten-bit resolution; includes software. $125
Micro R&D, Inc.

Universal Input/Output Board
Plugs into expansion port, allowing 16 analog channels and providing 16 high-current discrete outputs. $225
Micro R&D, Inc.

Applications Hardware

Aprospand-64 Expander
Four-slot expander features a system-reset button and fuse protection; each slot is independently switched. $34.95
Apropos Technology

Aproteck 1000 EPROM Programmer
An RS-232 connectable EPROM programmer; includes C-64 driver software. $265
Apropos Technology

Cartridge Expander
Allows you to plug in up to three modules to your computer at one time. $24.95
Navarone Industries, Inc.

COM Clock
Real-time clock/calendar with battery backup; includes autoboot feature. $69.95
Genesis Computer Corp.

Computereyes
This video acquisition system captures real-world images on your computer's high-resolution graphics display, which can then be reproduced on a printout. $129.95
Digital Vision, Inc.

80-Column Video Board
Transforms 40-column screen into 80-column display; eliminates snow, fuzziness, hashing and interference. $169.95
Batteries Included

Fastext Turbo-ROM
Enables the Smith-Corona Fastext-80 to emulate a Commodore 1525 printer when used with the Cardco G-Wiz. $19.95
Romco

Multitask 64
Plugs in up to three cartridges and hooks up to five computers, one printer and disk drive. $149.95
Handic Software

The Operating System
A cartridge-based customizing component that reconfigures the C-64's operating system to provide such features as escape keys, default to disk drive and improved video displays. $54.95
Hacker's Hardware

Ramdisk
Emulates most standard Commodore disk drive commands; software included. $325
Front Line Systems

The Serial Box
A 64K serial port print turbo-buffer that lets you use your computer while your printer is printing. $49.95
R.J. Brachman Associates, Inc.

The Spartan
Apple II+ emulator allows the C-64 to run Apple II+ software. $599
Mimic Systems, Inc.

Stardos
This plug-in enhancement system increases your disk drive's speed and is compatible with your entire software library. $64.95
Starpoint Software

Turbo-ROM
An easily installed replacement for the standard ROM that comes with your Cardco +G. $19.95
Romco

ZOT
An EPROM programmer that lets you program all or part of an EPROM chip. $170 Canadian
Serendipity Ventures, Inc.

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Cables

C-128/80
This five-foot video adapter cable enables the C-128 to output 80-column monochrome displays to any standard composite video monitor. $9.95
Cardco, Inc.

KN-128-1
This cable allows you to use any monitor with the C-128's 80-column mode. $14.95
Knight Software, Ltd.

Interex-5
This monitor cable replaces the five-pin connector with a four-pin RCA plug. $6.95
DSI

Interex monitor cables
RGB monitor cables connect your C-128 to monitors by Sakata, Amdek, Princeton, Zenith, NEC, Panasonic, Taxa and Sharp. $20.95–$35.95
DSI

Computers

Commodore 128 Personal Computer
Offers 128K RAM expandable to 512K; user-selectable 40- and 80-column full-color display; compatible with C-64 and CP/M software; 92-key keyboard, including numeric keypad; operates with optional mouse controller. $299
Commodore International, Ltd.

Disk Drives

BCD5-25 Disk Drive
Reads and writes programs faster and stays cooler than Commodore disk drives. $179
Blue Chip Electronics, Inc.

CS-1
Commodore 1541-compatible, with proprietary operating system, Q-DOS. $239.99
Peripheral Systems of America

NPH-501C
Formats a disk in 38 seconds; includes external power supply. $189
Video Logic Corp.

SFD-1001
Offers one-megabyte storage capacity on a double-sided, double-density format. $399.95
Progressive Peripherals and Software, Inc.

ST10C
This hard-disk drive system features unlimited directory space, 154 tracks, IEEE and serial interface. $1595
Computer Specialties, Inc.

Clone II
Copies, formats and verifies a disk in under two minutes; C-64-compatible; can daisy-chain up to four drives. $499
HBH Sales Company

Commodore 1571 Disk Drive
This double-sided, 5¼-inch floppy disk drive offers 360K–410K formatted storage capacity. Operates at 300 cps in C-64 mode; operates at 2000 cps in C-128 mode and can read most CP/M-formatted programs. $300
Commodore International, Ltd.

Commodore 1572 Dual Disk Drive
This disk drive offers a transfer rate of up to 5200 cps and up to 820K of data storage. It features two 5¼-inch disk drives that can select the C-64, C-128 and CP/M formats; compatible with other computers using 5¼-inch CP/M formats. Price N/A
Commodore International, Ltd.

Enhancer 2000
Commodore-compatible 5¼-inch drive with direct-drive motor and an average mtbf rate of 10,000 hours. $199.95
The Comtel Group

Lt. Kernal
Supports storage capacities from five to 144 megabytes and implements all 1541 DOS functions; package includes cartridge-port interface, disk/controller subsystem and software. $1595
Fiscal Information, Inc.

Mirage Disk Drive
Features built-in parallel printer interface and word processing, file management and Mirage Utility Disk programs. $249.95
World Disk Drive

Quick Data Drive
This disk drive uses microwafers instead of disks and loads a 24K program in 20 seconds. $84.95
Entrepo, Inc.

Disk Drive Coolers

Cool Stack
This disk-drive cooling unit allows two 1541s to be stacked one on top of the other. $64
Carbo Tech, Inc.

Single-drive Cooling Unit
Cooler for your 1541 disk drive comes with filters. $34
Carbo Tech, Inc.

UniKool C-100 Disk Drive Fan
Fan moves filtered air through disk drive to reduce drive misalignment problems caused by heat build-up. $39.95
UniKool

Expansion Boards

XL 80
An 80-column video board with Basic enhancements, word processor, spreadsheet with graphing option, smart terminal for telecommunications and disk-copy utility. $99
Data 20 Corp.

Analog Interface Board
This board provides eight channels analog to digital and eight channels digital to analog. $195
Computer Continuum

DOS Board
The board allows you to simplify complex disk operating statements and increase the data transfer speed of your 1541 disk drive system. $99.95
Search Consultants International

Single-slot Expansion Board
Fully switched, including game, enable and power switches, and reset button. $24.95
CSM Software, Inc.

General Interfaces

1541 Flash!
Connects between your computer and the 1541 disk drive to enable faster loads and saves of programs and data; wedge included. $90
Skyles Electric Works

E-Link
A serial-to-IEEE interface connects IEEE disk drives and printers to your computer. $99.95
Progressive Peripherals & Software, Inc.

JE232CM
This adapter allows you to connect standard serial RS-232 printers and modems to your Commodore computer. $39.95
Jameco Electronics

Handic V24 RS-232 Interface
This interface lets your computer communicate with printers and modems. $64.95
Handic Software

MicolMon
A machine-language monitor and user-to-computer interface designed to help you debug your programs. $24.95
Micol Systems

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MIDI Interface
Connects MIDI instruments to your computer; syncs to and from MIDI, tape and drum machines. $149.95 (includes drum sync); $199.95 (includes tape and drum sync)
Passport Designs, Inc.

MIDI Magic
A musical instrument digital interface that allows you to connect your computer to many electronic musical instruments. $49.95
Q-R-S Music Rolls, Inc.

Network
A multi-user system that can connect up to eight computers to one printer and a single disk drive. $149.95
Handic Software

Projector Control PC/I
This Carousel slide projector interface connects to your C-64 to provide random-access slide searches and includes the Slide-Finder cataloging and retrieval software. $697
Interactive Technology, Inc.

Ham Radio Interfaces

RF Receiver Interface
Receives RF signals from remote RF transmitters. $149.95
Genesis Computer Corp.

RTTY Computer Interface
Lets you send and receive computerized RTTY/ASCII/AMTOR/CW and copies on both mark and space tones. $99.95
MFJ Enterprises, Inc.

Deluxe RTTY Computer Interface
Interfaces your computer to a ham radio transceiver or receiver for Morse code, RTTY and ASCII; includes software on tape. $179.95
MFJ Enterprises, Inc.

Short Wave Listener
For reception of Morse code and radio teletype signals between your computer and short wave radio. $64
Microlog Corp.

Universal Receiver Computer Interface
Use your computer to receive commercial, military and amateur traffic. $69.95
MFJ Enterprises, Inc.

Joysticks, Trackballs & Game Paddles

CSP
Commodore-compatible game paddles. $4.95
Jameco Electronics

Commodore Joystick
Includes MazeMaster feature for four- or eight-direction operation, and an eight-foot cord. $12.95
Kraft Systems

Competition Pro 200X
This joystick features a five-foot cord and a fire-button that is molded into the joystick case. $8.95
Coin Controls, Inc.

Switch Hitter
This joystick provides two fire-buttons for left- and right-handed play. $14.95
Kraft Systems

Trackball
Duplicates play-action of arcade machines and features 360° movement. $49.95
Wico Corp.

Keyboards & Input Pads

Add-On Numeric Keypad
Besides the 0–9 keys, the keypad includes +, −, / and *, two cursor keys and enter keys. $69.95
Quality Computer

Cardkey-1
This numeric keypad is configured in the standard calculator-keyboard layout; software included. $49.95
Cardco, Inc.

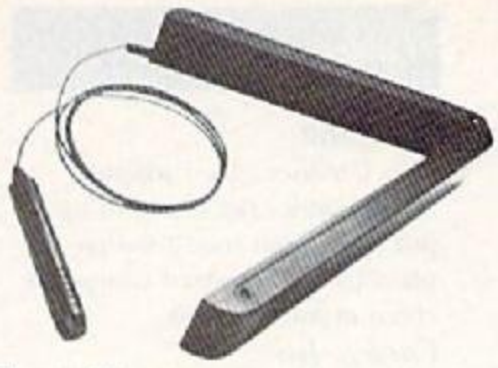
Nimble Numbers Keypad
Keypad includes cursor keys, return, shift, clear/home, insert/delete and selectable period and comma keys. $65 Canadian
Serendipity Software, Inc.

Numeric Keypad
Compatible with all software and with extra functions. $64.95
CSM Software, Inc.

Input Devices

Animation Station
This is a touch-sensitive graphics tablet that serves as a graphics and text processor. $79.95
Suncom

Commodore Mouse
The mouse simplifies data input and manipulation on the C-128 by allowing you to paint pictures on the screen and to select menu options without typing in commands. $49.95
Commodore International, Ltd.



Space Pen
Utilizes ultrasonic technology to take the place of light pens, mice, joysticks, paddles, touch screens and touch tablets. $150
Soniture, Inc.

The Space Tablet
This input device allows you to send three-dimensional ultrasonic signals to your computer from as far away as six feet, and it can be used with existing graphics packages. $150
Soniture, Inc.

Sure Light Pen
Features include one-pixel accuracy, high resolution and Color Easy, to use with a free-drawing program. $22.95
Creative Enterprises

Tech Sketch
Light pen; includes software. $49.95
Tech Sketch, Inc.

Memory Expansion Devices

Access-M
A memory expansion board that plugs into the ROM expansion port of your computer; includes software and allows memory expansion of up to one megabyte. $199.95
Mosaic Electronics, Inc.

RAMdisk-64
64K memory-expansion cartridge includes RAMdisk software. $129.95
P Technologies

Miscellaneous

CPS-10
This power supply has two 100-watt outlets, surge and spike protection, RFI and EMI protection. $59.95
HBH Sales Company

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Classic Laid Stationery
Continuous clean-edge perf stationery has a detached size of 7⅞ × 11 inches and matching continuous envelopes. Package of 100 sheets of stationery is $4.50; package of 50 continuous envelopes is $9
CompuGreet

Commodore 1902 RGBI Composite Monitor
This monitor supports 40- and 80-column color display; compatible with videocassette recorders and all computers using RGBI or composite output, including the C-128. $300
Commodore International, Ltd.

Copy Holder
Fully adjustable magazine holder clamps onto desk to free your hands for typing in program listings. $32
Carbo Tech, Inc.

Custom-made Dust Covers
Custom-made, matching vinyl dust covers come in light tan or brown, for all Commodore computers, monitors, disk drives and printers. $5–$23
Crown Custom Covers

Digi-Cam
Produces a 320- × 200-dot black-and-white screen image and includes digitizer, software, cables and monochrome camera with 12mm lens. $250
Cardco, Inc.

Hi-Rise Computer/ Printer Stand
This stand is constructed of solid oak and uses less than two square feet to contain your monitor, disk drive and printer. $39.95
Unique Wood Products

How to Operate the Commodore 64
Takes the beginner from unpacking the computer through basic operations and keyboard functions; comes with two audio tapes, several programs on cassette and a reference guide. $25
FlipTrack Learning Systems

Media Mate 5 Plus
A lockable filing and storage system that holds up to 50 5¼-inch disks and can be stacked for storage and transported without scattering disks. $20.95
Amaray International Corp.

Nibble Notch I Disk Tool
Accurately cuts a square write notch in your 5¼-inch disks to allow you to use the back side of the disk. $14.95
Nibble Notch Computer Products

Read/Write Micro-computer Cleaning Kit
Includes a floppy disk head cleaner and metered spray, Static Stopper, Static Stopper cloth, 30 Datawipes, 24 CRT terminal cleaning pads and ten office equipment cleaning pads. $34.95
The Texwipe Co.

Reset Master
A reset switch that resets your computer, restores control in case of a lockup and operates two printers concurrently. $24.95
Master Software

ROM Descender Chip
Works with Commodore 801 and 1525 printers. $29.95
Wilanta Arts

Smart Strip
The Smart Strip automatically turns periphrals on and off and provides surge protection. $54.95
RSR Manufacturing

Static Buster
This static control device consists of two foampads that connect to the CRT face and the keyboard. $49.95
Lamb's Information Systems, Inc.

Thermocouple Amplifier
Takes up to 16 low-voltage inputs and produces a corresponding voltage output in the range of 0–4 volts dc. $105 for first channel; $85 per additional channel.
Micro R&D, Inc.

Modems

C-64 Modem
Use this 300-baud modem with single- or multi-line phones. $49.95
MFJ Enterprises, Inc.

GE 3-8200 Modem
Offers a 300-baud signal rate and a choice of both direct and acoustic connection. $119.95
General Electric Co.

Commodore 1660 Modem/300
This direct-connect modem operates at 300 baud and features auto-answer, auto-dial and a built-in speaker. $129.95
Commodore International, Ltd.

Commodore 1670 Modem/1200
This 1200-baud direct-connect telephone interface features auto-answer/auto-dial, auto-baud and parity, and is compatible with Commodore's 300-baud modems. $199.95
Commodore International, Ltd.

Lightning 24
This 300/1200/2400 bps modem offers auto-dial/auto-answer capabilities, low power consumption and three-speed operation. $599
Anchor Automation, Inc.

Mitey Mo
Auto-answer, auto-dial modem includes Smart 64 software and free CompuServe and PlayNet access time. $119
Computer Devices International

Mercury
A 300/1200-baud modem that supports all popular communications software packages and features front-panel display lights. $265
Computer Friends

Total Telecommunications
A modem and intelligent modem software gives you access to over 50 databases. $124.95
TeleLearning Systems, Inc.

Music Keyboards & Sound Devices

Concertmaster
A 40-note unit with detachable cover that doubles as a music holder; includes software Price N/A.
Melodian, Inc.

Incredible Musical Keyboard
Fits on top of C-64 keyboard, no external cable connections required; 24 piano-style keys. $29.95
Sight & Sound Music Software, Inc.

MusicMate
Fully-functional keyboard, with full-size keys; fully polyphonic; includes software. $99
Sequential, Inc.

Music Port
A musical keyboard and software system that features a 37-key electronic keyboard with digital synthesizer capability and allows you to create your own accompaniment. $149
Tech Sketch, Inc.

RoomMate
This stereo-speaker set is compact and lightweight and, with an RCA-plug adapter, works with any sound source that has a headphone or phono jack. $229
Bose Corp.

Soundchaser 64 Keyboard
Four octaves; includes composing and synthesizer software. $199
Passport Designs, Inc.

Video RoomMate
Stereo-speaker set offers volume control and shielded drivers to prevent television interference. $229
Bose Corp.

Printers

1101
Uses standard IBM Selectric-type ribbon cartridges; 13-inch platen; uses serial cable in place of interface. $349.95
Commodore International, Ltd.

D12/10
A 12-cps daisywheel printer; includes Commodore interface and software. $249
Blue Chip Electronics, Inc.

D20/10
20-cps daisywheel printer with C-64 Centronics I/O built in. $279
Blue Chip Electronics, Inc.

M120/NLQ
Dot-matrix printer with Near Letter Quality mode, 120 cps; includes C-64 I/O and word processor. $249
Blue Chip Electronics, Inc.

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MPS 803
This 6×7 dot-matrix printer is bi-directional and features all alphabetic, numeric and PET graphics characters, 60 cps and 80-column width. $199.95
Commodore International, Inc.

SG-10C
A dot-matrix printer with near letter-quality print option and print speeds of 30 and 120 cps. $299
Star Micronics

SG-15 Printer
This is a 15-inch, dual-mode printer capable of both draft (at 120 cps) and near letter-quality (at 30 cps) printing. $499
Star Micronics

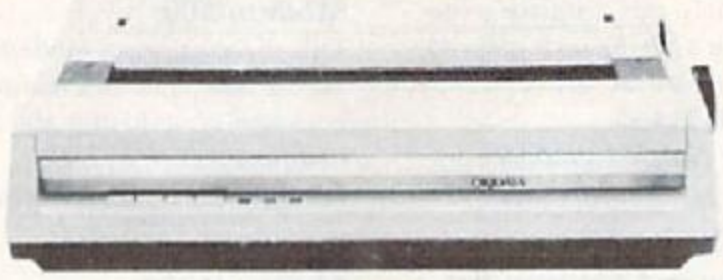
Aprotek Daisy 1120 Printer
Features include four front-panel pitch selections, automatic paper load and switch-selectable page length. $353
Apropos Technology

Cardprinter LQ/2
This printer prints at 12 cps, 12 cpi bi-directionally with logic seeking. $350
Cardco, Inc.

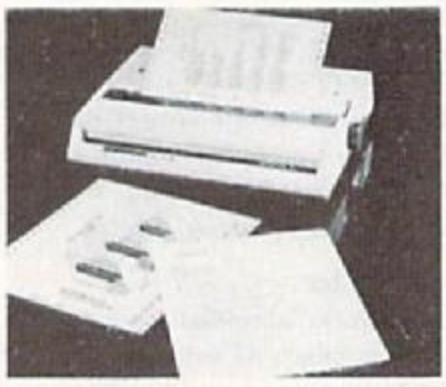
Commodore MPS-1000 Printer
This printer features three operating modes: a high-speed draft that prints documents at 100 cps, a near-letter-quality mode at 16 cps and a graphics mode with a print density of 50–240 dots per inch. $299.95
Commodore International, Ltd.

HomeWriter 10
This dot-matrix printer can produce many popular typestyles at 100 cps and includes a C-64 compatible cartridge. $320
Epson America, Inc.

Microline 182
A printer for heavy business and home use that can be used to print graphics and charts. $299
Okidata

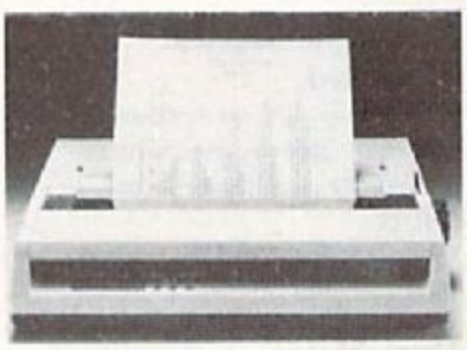


Microline 192
High-resolution, correspondence-quality bi-directional printer with snap-in cartridge ribbon. $499
Okidata



Model 3-8100 Dot-matrix Printer
Features include automatic line-feed, full graphics capacity and a choice of either 25 or 50 cps print speed. About $390
General Electric Co.

Okimate 10
A dot-matrix ribbon transfer printer with full graphics capabilities; prints over 40 color shades. $149
Okidata



Okimate 120
Seven print modes for bidirectional dot-matrix printer, comes with computer paper. $269
Okidata

Seikosha SP-100 VC Printer
A high-resolution dot-matrix printer with Commodore direct-connect; 100 cps, multiple fonts, tractor and friction feed, plus correspondence quality. $279.95
Apropos Technology

Printer Interfaces

ApriCord CD
This printer interface allows parallel graphics printers to emulate Commodore printers. $69.95
Apricorn

Card/?PS
A universal parallel/serial printer interface uses standard Commodore printer format; driver programs not required. $79.95
Cardco, Inc.

Centronics Interface
Designed to allow Commodore computers to output to parallel interface printers; supports seven or eight bits. $89.95
Computer Specialties, Inc.

The Connection
A parallel printer interface that supports all standard printer commands, features a 2K buffer and is compatible with any parallel printer equipped with a Centronics interface. $69.95 (non-Epson); $73.95 (Epson)
Tymac Controls Corp.

G-Wiz
An interface to connect your computer to any Centronics printer and features increased print speed on many dot-matrix printers, open access to DIP switches and a choice of two character sets. $66.95
Cardco, Inc.

Grappler CD
A parallel interface with four modes includes screen dumps and supports most printers via a DIP switch. $119
Orange Micro, Inc.

Parallel Printer Interface
This interface includes a graphics buffer. $49.95
DSI

Printer Interface
Complete graphics emulation of Commodore printers, with switch settings for all standard parallel printers. $129
Micro R&D, Inc.

Printmaster/+G
This parallel printer interface emulates Commodore printers and supports full graphics and graphics characters. $119.95
Omnitronix, Inc.

Printmaster/S
This is an RS-232 printer interface that hooks up to the Commodore serial bus and is switch selectable for 300, 600, 1200 and 2400 baud. $119.95
Omnitronix, Inc.

Serial and Graphics Printer Interfaces
The SPI, SPI/B and GPI interface Centronics parallel compatible printers. $59.95 (SPI); $69.95 (SPI/B); $79.95 (GPI)
Xetec, Inc.

Robotics

Micro-Kitten
This mobile robot kit has a range of uses, including automation modeling, transporting, drawing and gaming; expansions include sensing devices, radio control and on-board intelligence. $330 (assembled); unassembled kits available.
Spectron Instrument

Robotic Programming Kit
A robotics construction kit with robot-control language includes projects suitable for beginner and engineer. $199
Parsec Research

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The Valiant Turtle
A remote-controlled programmable robot to make programming concepts accessible to children as young as pre-school age. $399.95
Harvard Associates

Sensors & Control Devices

1020 Control Interface
Provides 32 digital inputs and outputs for measurement and control applications. $159
Innovative Technology

ADC-1
This is a measurement, monitoring and control system that allows you to aquire data and control external devices. $395
Remote Measurement Systems

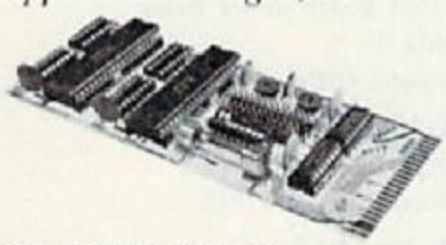
REL 64 Relay Cartridge
Plugs into user port and controls lights, alarms, phones and garage doors. $39.95
Handic Software

X-10 Powerhouse
This interface system controls lights and appliances; includes software and cable. $150.00
X-10 (USA), Inc.

Comp-U-Temp, Version 1.0
Eight-channel temperature monitor records temperatures as low as −15°F. $89.95
Applied Technologies, Inc.

Comp-U-Temp, Version 2.0
Eight-channel temperature monitor stores data to, and reads from, disk. $109.95
Applied Technologies, Inc.

Comp-U-Temp Version 3.0
16-channel temperature monitor includes four sensors and software. $179.95
Applied Technologies, Inc.



Dual 6522 VIA Board
Among other uses, this versatile interface adapter controls and monitors the lights, temperature and security system in your home. $169
Schnedler Systems

Home Control System
This control system includes BSR X-10 control, real-time clock/calendar and six-port input device. $199.95
Genesis Computer Corp.

Powerport
This energy control device, for home and business use, regulates your heating, lighting and cooling systems. Under $100
Savergy, Inc.

Sensatrol
This sensor/controller interface allows you to measure weather conditions, control thermostats and monitor environmental conditions. $385
Data World Products

Sensors for Comp-U-Temp
Weather-protected encapsulated thermistors. $5.75 each
Applied Technologies, Inc.

Simple IF Data Acquisition System
Allows you to control temperature, monitor the weather, measure voltage and use in robotics. Under $100
Proteus Electronics, Inc.

Temperature Sensor
Temperature readings from −55°C to 150°C. $25
Micro R&D, Inc.

Synthesizers

64-Talker
Self-contained speech synthesizer features text-to-speech and multiple voices. $89
Talktronics, Inc.

JE520CM
A voice synthesizer with more than 250 basic words; prefixes and suffixes allow you to form over 500 words. $99.95
Jameco Electronics

Personal Speech System
Converts computer data into spoken English. $395
Votrax, Inc.

Pro-Voice
A speech synthesizer, including ROM-based text-to-speech translation and 13 new Basic commands. $99.95
Genesis Computer Corp.

Type-'N-Talk
Converts computer data into spoken English and operates from a CMOS synthesis chip and general microprocessor. $249
Votrax, Inc.

Voice Master
A speech synthesizer that makes your computer speak to you in your own voice, respond to your spoken commands and play back songs that you hum or whistle. $89.95
Indus-Tool

Voice Master Speech System
A digital speech recording/playback system with voice recognition and musical capabilities; includes the Voice Master module, microphone, earphone headset, software and user's manual. $89.95
Covox, Inc.

Voice Messenger
A speech synthesizer with unlimited vocabulary and direct text-to-speech capability. $59.95
Research in Speech Technology, Inc.

Hardware Manufacturers Address List

Amaray International Corp.
14935 N.E. 95th St.
Redmond, WA 98052

Anchor Automation, Inc.
6913 Valjean Ave.
Van Nuys, CA 91406

Applied Technologies, Inc.
Lyndon Way
Kittery, ME 03904

Apricorn
7050 Convoy Court
San Diego, CA 92111

Apropos Technology
1071-A Avenida Acaso
Camarillo, CA 93010

Batteries Included
17875 Sky Park North, Suite P
Irvine, CA 92714

Blue Chip Electronics, Inc.
2 W. Alameda
Tempe, AZ 85282

Bose Corp.
The Mountain
Framingham, MA 01701

R.J. Brachman Associates, Inc.
PO Box 1077
Havertown, PA 19083

CSM Software, Inc.
PO Box 563
Crown Point, IN 46307

Curbo Tech, Inc.
PO Box 652
Snellville, GA 30278

Cardco, Inc.
300 S. Topeka
Wichita, KS 67202

The Comtel Group
1651 East Edinger, Suite 209
Santa Ana, CA 92705

Coin Controls, Inc.
2609 Greenleaf Ave.
Elk Grove, IL 60007

Commodore International, Ltd.
1200 Wilson Drive
West Chester, PA 19380

CompuGreet
PO Box 3357
Reston, VA 22090

Computer Continuum
75 Southgate Ave., Suite 6
Daly City, CA 94015

Computer Devices International
1345-A2 Doolittle Drive
San Leandro, CA 94563

Computer Friends
6413 S.W. Canyon Court, Suite 10
Portland, OR 97221

Computer Specialties, Inc.
PO Box 1718
Melbourne, FL 32902

Covox, Inc.
675-D Conger St.
Eugene, OR 97402

Creative Enterprises
PO Box 2477
Big Bear City, CA 92314

Crown Custom Covers
9606 Shellyfield Road
Downey, CA 90240

DSI
717 S. Emporia
Wichita, KS 67211

Data 20 Corp.
23011 Moulton Parkway, Suite B10
Laguna Hills, CA 92653

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Data World Products
PO Box 33
Francestown, NH 03043

Digital Vision, Inc.
14 Oak St., Suite 2
Needham, MA 02192

Entrepo, Inc.
1294 Lawrence Station Road
Sunnyvale, CA 94089

Epson America, Inc.
2780 Lomita Blvd.
Torrance, CA 90505

Fiscal Information, Inc.
PO Box 10270
Daytona Beach, FL 32020

FlipTrack Learning Systems
999 Main St., Suite 200
Glen Ellyn, IL 60137

Front Line Systems
38 Broadway St.
Westford, MA 01886

General Electric Co.
Electronics Park
Syracuse, NY 13221

Genesis Computer Corp.
Ben Franklin Tech Center
Lehigh University
Bethlehem, PA 18015

HBH Sales Company
225 West Main
Collinsville, IL 62234

Hacker's Hardware
PO Box 7933
San Diego, CA 92107

Handic Software
400 Paterson Plank Road
Carlstadt, NJ 07072

Harvard Associates
260 Beacon St.
Somerville, MA 02143

Indust-Tool
730 West Lake St.
Chicago, IL 60606

Innovative Technology
510 Oxford Park
Garland, TX 75043

Interactive Technology, Inc.
PO Box 948
Springdale, AR 72765

Jameco Electronics
1355 Shoreway Road
Belmont, CA 94002

Knight Software, Ltd.
Box 975-G6
Plainfield, CT 06374

Kraft Systems
450 West California Ave.
Vista, CA 92083

Lamb's Information Systems, Inc.
301 N. Main St.
Pueblo, CO 81003

MFJ Enterprises, Inc.
921 Louisville Road
Starkville, MS 39759

Master Software
6 Hillery Court
Randallstown, MD 21133

Melodian, Inc.
115 Broadway, Suite 1202
New York, NY 10006

Micol Systems
100 Graydon Hall Drive,
Suite 2301
Don Mills, Ontario, Canada
M3A 3A9

Microlog Corp.
18713 Mooney Drive
Gaithersburg, MD 20879

Micro R&D, Inc.
3333 S. Wadsworth Blvd., A-104
Lakewood, CO 80227

Mimic Systems, Inc.
1112 Fort St., 6th Floor
Victoria, B.C., Canada V8V 4V2

Mosaic Electronics, Inc.
PO Box 708
Oregon City, OR 97045

Navarone Industries, Inc.
19968 El Ray Lane
Sonora, CA 95370

Nibble Notch Computer Products
4211 N.W. 75th Terrace
Fort Lauderdale, FL 33319

Okidata
532 Fellowship Road
Mt. Laurel, NJ 08054

Omnitronix, Inc.
PO Box 43
Mercer Island, WA 98040

Orange Micro, Inc.
1400 N. Lakeview Ave.
Anaheim, CA 92807

P Technologies
6905 Speckle Way
Sacramento, CA 95842

Parsec Research
41805 Albrae St.
Fremont, CA 94538

Passport Designs, Inc.
625 Miramontes St.
Half Moon Bay, CA 94019

Peripheral Systems of America
2526 Manana Road, Suite 209
Dallas, TX 75220

Progressive Peripherals Software, Inc.
2186 South Holly
Denver, CO 80222

Proteus Electronics, Inc.
RD #2, Spayde Road
Bellville, OH 44813

Romco
PO Box 18359
Wichita, KS 67218

Q-R-S Music Rolls, Inc.
1026 Niagara St.
Buffalo, NY 14213

Quality Computer
801 S. Victoria Ave.,
Suite 104
Ventura, CA 93003

RSR Manufacturing
6337 S. Highland Drive,
Suite 1054
Salt Lake City, UT 84121

Remote Measurement Systems
PO Box 15544
Seattle, WA 98115

Research in Speech Technology, Inc.
104 W. Fourth St.
Royal Oak, MI 48067

Savergy, Inc.
1404 Webster Ave.
Fort Collins, CO 80524

Schnedler Systems
1501 N. Ivanhoe St.
Arlington, VA 22205

Search Consultants International
PO Box 401
Haslett, MI 48840

Sequential, Inc.
3051 North First St.
San Jose, CA 95134

Serendipity Venture, Inc.
PO Box 1944
Saskatoon, Saskatchewan,
Canada S7K 3S5

Sight & Sound Music Software, Inc.
3200 South 166th St.
New Berlin, WI 53151

Skyles Electric Works
231-E South Whisman Road
Mountain View, CA 94041

Soniture, Inc.
480 Vandell Way
Campbell, CA 95008

Spectron Instrument
Robot Division, MS 36
1342 W. Cedar Ave.
Denver, CO 80223

Star Micronics
200 Park Ave.
New York, NY 10166

Starpoint Software
Star Route
Gazelle, CA 96034

Suncom
260 Holbrook Drive
Wheeling, IL 60090

Talktronics, Inc.
27341 Eastridge Drive
El Toro, CA 92630

Technical Hardware, Inc.
PO Box 3609
Fullerton, CA 92634

Tech Sketch, Inc.
26 Just Road
Fairfield, NJ 07006

TeleLearning Systems, Inc.
505 Beach St.
San Francisco, CA 94133

The Texwipe Co.
PO Box 575
Upper Saddle River, NJ 07458

Tymac Controls Corp.
127 Main St.
Franklin, NJ 07416

Ultrabyte
PO Box 789
La Canada, CA 91011

UniKool
909 Williamson Loop Road
Grants Pass, OR 97526

Unique Wood Products
PO Box 52
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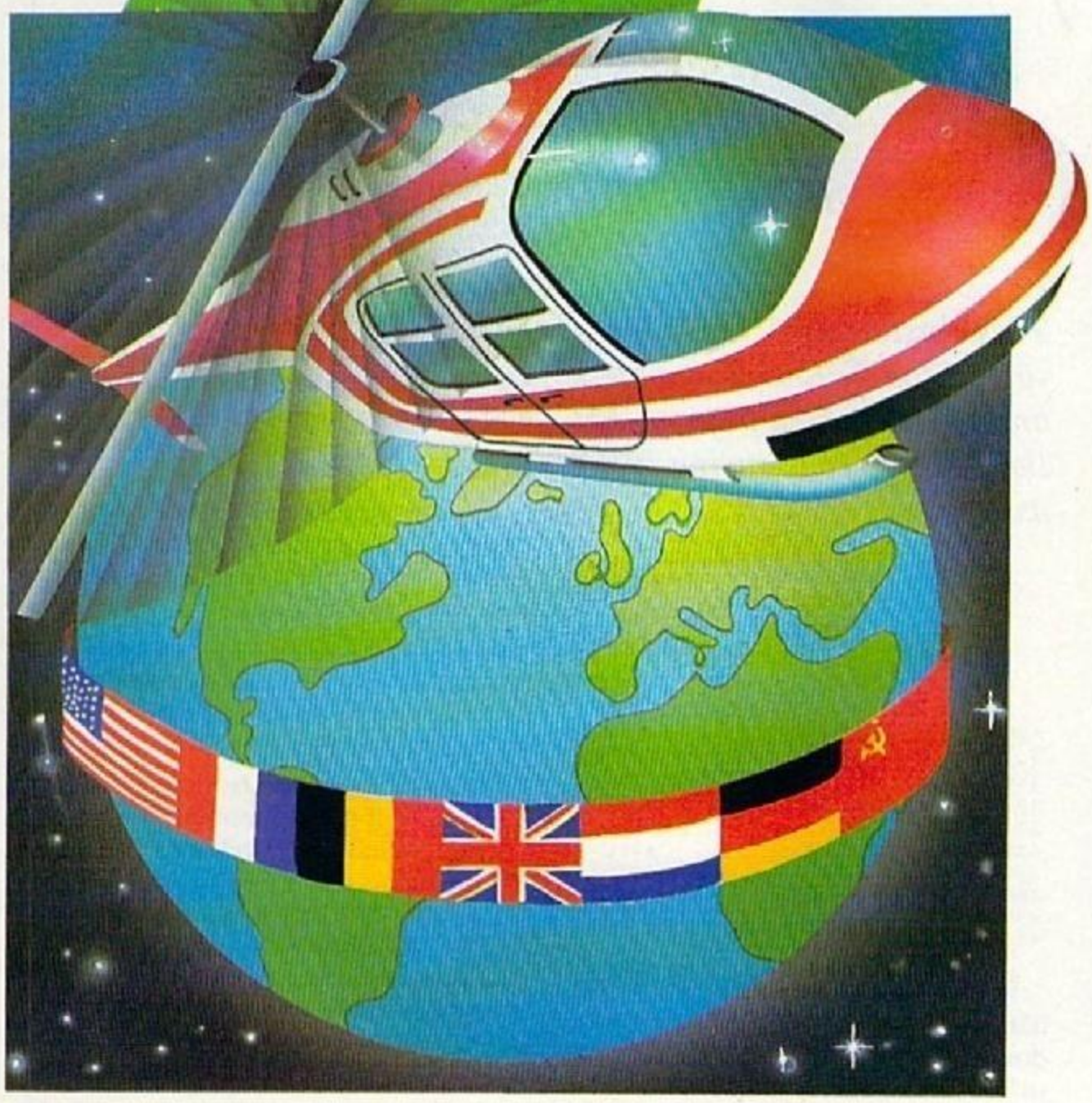

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Easy Assembly VI

By WILLIAM B. SANDERS

Up to this point, we've been using a single register—the accumulator, or A, register. This month's installment introduces the X and Y registers along with new addressing modes. We'll start with the instructions that are similar to those using the accumulator; then we'll examine how to use these new registers interactively with the accumulator in new modes. First, let's review the instructions you have so far for the accumulator:

LDA Absolute and Immediate modes
STA Absolute and Immediate modes

You know that LDA refers to LoaD the Accumulator and STA means STore the Accumulator. What do you think the following mean?

LDX LDY STX STY

If you guessed they refer to loading and storing the X and Y register contents, you're absolutely right. They work exactly like the A register instructions in both the Absolute and Immediate modes. To illustrate the use of these registers, we'll use the screen and color addresses to place values. Screen addresses begin at $400 (1024) and color addresses begin at $D800 (55296). They are sequentially arranged in 25 rows of 40 columns, beginning in the upper left-hand corner of your screen.

Let's write a quick program to show what happens when you use these registers to store values in the color and screen locations:

```
LN  LABEL  OPCODE  OPERAND  COMMENT
-------------------------------
 1         JSR     $E544    CLR/HOME
 2         LDA     #1       WHITE
 3         STA     $D800    COLOR
 4         LDX     #1       'A'
 5         STX     $400     SCRN MEM
 6         STA     $D801    NEXT COL
 7         LDY     #2       'B'
 8         STY     $401     NEXT SCR
 9         RTS
```

This installment introduces you to the X and Y registers and tells you how to print out the source code using your assembler.

```
ADRS     OPCODE    OPERAND
49152    JSR       $E544
49155    LDA#      1
49157    STA       $D800
49160    LDX#      1
49162    STX       $400
49165    STA       $D801
49168    LDY#      2
49170    STY       $401
49173    RTS
```

So far, these registers work just like the accumulator. In fact, there doesn't seem to be any reason at all to use them, since you haven't seen anything they can do that cannot be done with the accumulator alone. Well, if you think that, then take a careful look at the program.

Notice that in line 2, you load the accumulator with the value 1. Then you store that 1 in $D800, the color address for the character in the upper left-hand corner of your screen. Then, in line 6, you store the same value in $D801, the next screen color address.

The significance of that little move is that by using the X and Y registers, you were able to keep a constant value in the A register. Conversely, you could have stored that value in either the X or Y register. Granted, you only saved a single step, since, without the other registers, you would have had to reload only the accumulator. However, you'll find more and more steps to be saved, making your programming task simpler as you use the different registers and instruction modes.

Register Transfer

In some applications, it will be necessary to transfer the contents of one register to another. To do that, you have four instructions:

TAX Transfer Accumulator to X register
TAY Transfer Accumulator to Y register
TXA Transfer X register to Accumulator
TYA Transfer Y register to Accumulator

Those of you who are sharper than the author of this column may be wondering, "What about transferring the X register to the Y register and vice versa?" To do that, it is necessary to first go through the accumulator. For example, if you wanted to transfer the X register contents to the Y register, you would have to execute the following sequence:

TXA X contents go to Accumulator
TAY A contents go to Y register

See if you can figure out how to transfer the Y to the X register.

These instructions are in the Implied mode and use up only a single byte. However, before using them in a program, there are some other X and Y instructions we should learn. These instructions increment (add) or decrement (subtract) 1 from the X or Y registers. They look like this:

INX Increment the X register
INY Increment the Y register
DEX Decrement the X register
DEY Decrement the Y register

They, too, are in the Implied

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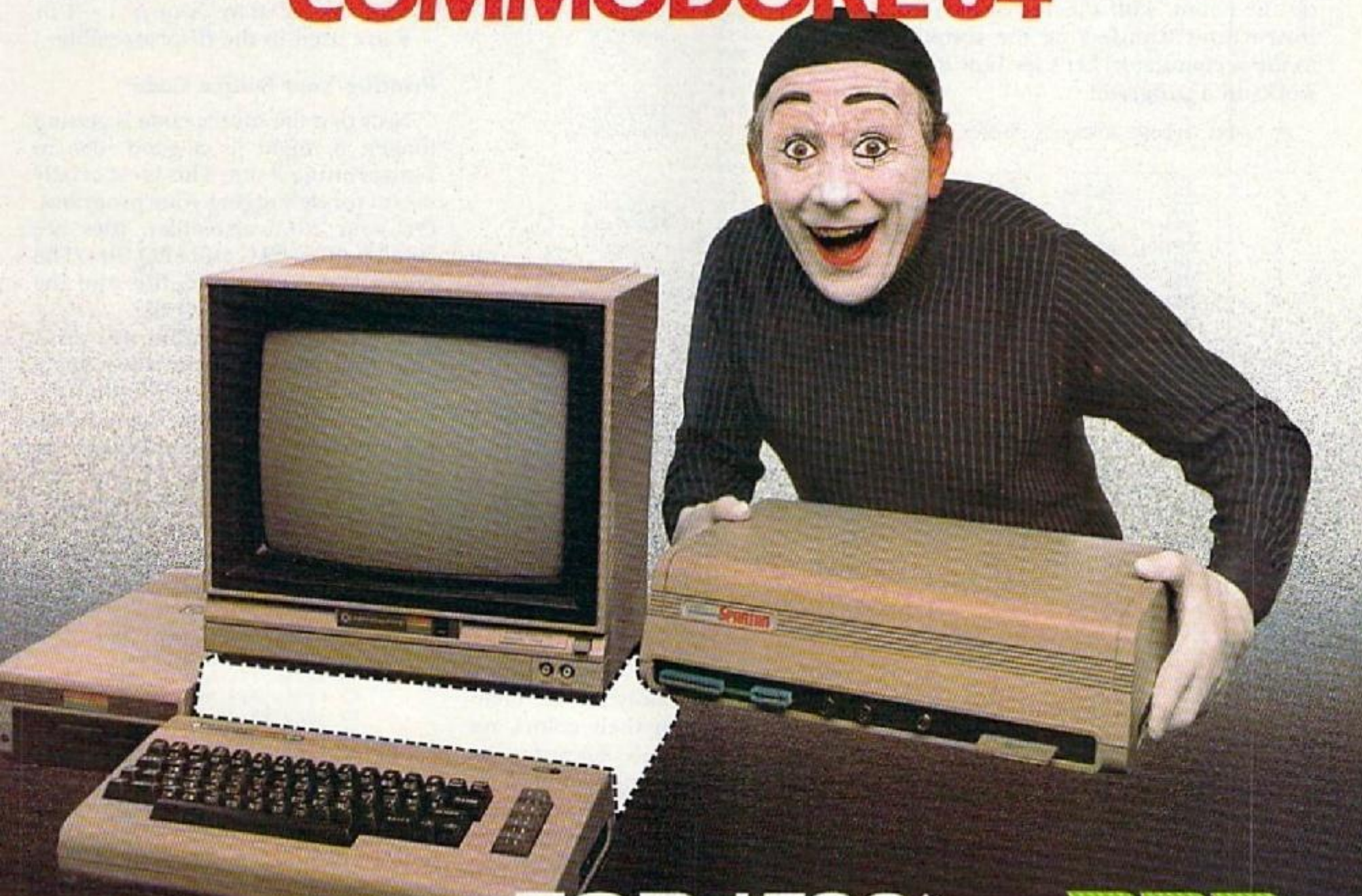

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mode. Let's look at an example. If the X register has the value 55 in it and the INX instruction is given, then the X register is incremented by 1, making the value 56. A DEX instruction would subtract 1 from the X register, making it 54.

There is no increment/decrement instruction for the accumulator; so when "counting" is used in a program, often the X or Y register will do the count, with the TXA or TYA instructions transferring the results to the accumulator. Let's see how this works in a program:

```
LN LABEL OPCODE OPERAND COMMENT

------------------------------
 1       JSR    $E544    CLR/HOME
 2       LDX    #65      ASCII 'A'
 3       TXA             X TO A
 4       JSR    $E716    TO SCREEN
 5       INX             X = X + 1
 6       TXA
 7       JSR    $E716
 8       INX
 9       TXA
10       JSR    $E716
11       RTS
```

```
ADRS        OPCODE        OPERAND
49152       JSR           $E544
49155       LDX#          65
49157       TXA
49158       JSR           $E716
49161       INX
49162       TXA
49163       JSR           $E716
49166       INX
49167       TXA
49168       JSR           $E716
49171       RTS
```

Now that you can do your ABC's in assembly language using TXA and INX, see if you can count from 9 to 0 using TYA and DEY. (Hint: ASCII 9 = 57.)

Indexed Addressing

This next mode of addressing, called Indexed Addressing, uses either the X or Y register (or both) and the accumulator. Basically, the X or Y register value is added to the current address to access the next address.

For example, let's say you want to use the screen addresses beginning at $400 (1024) and the color addresses beginning at $D800 (55296) and store characters in sequential locations. Using the X register as an index, you increment it to get the next screen and color address. To start, you load the X register with 0 (0 + address = first address). Then, STA is used in the Indexed mode to access $400 and $D800. The X register is incremented to 1 (1 + address = second address). In this case, it would be $401 and $D801.

Let's see how this looks and works in a program. We'll write ABC again, but this time we'll use screen and color addresses and indexed addressing. (Note: Different opcode conventions are used with the *RUN* assembler, and standard ones are used in indexed addressing.)

```
LN LABEL OPCODE OPERAND COMMENT

------------------------------
 1       JSR    $E544    CLR/HOME
 2       LDy    #1
 3       LDX    #0
 4       TYA
 5       STA    $400,X
 6       STA    $D800,X
 7       INX
 8       INY
 9       TYA
10       STA    $400,X
11       STA    $D800,X
12       INX
13       INY
14       TYA
15       STA    $400,X
16       STA    $D800,X
17       RTS
```

```
ADRS        OPCODE        OPERAND
49152       JSR           $E544
49155       LDY#          1
49157       LDX#          0
49159       TYA
49160       STA-X           $400
49163       STA-X           $D800
49166       INX
49167       INY
49168       TYA
49169       STA-X           $400
49172       STA-X           $D800
49175       INX
49176       INY
49177       TYA
49178       STA-X           $400
49181       STA-X           $D800
49184       RTS
```

When you activate this program, you'll see that not only are the characters changed, but their colors are also changed. That's because the same value that changed the characters was stored in the color addresses. Whenever you used TYA, you transferred the Y register value to the accumulator. The STA-X stored in the operand address the value that was stored in the accumulator, offset by the value in X. Notice that X started with 0 and Y started with 1; therefore, with each INX and INY, the value of X remained one less than Y.

The X and Y registers can be used as offsets in Indexed Addressing, but you cannot, in the Indexed mode, directly load or store the values in X or Y. It would be necessary first to transfer the X or Y value to the accumulator.

Before continuing, let's do a quick review of the various addressing modes you've used so far:

1. *Immediate*. This mode accesses the actual value in the operand field. It is signaled by the # sign.

2. *Absolute*. This mode accesses the value in the *address* in the operand field. No signal is used; just the opcode and operand. Be careful not to confuse the Immediate with the Absolute mode.

3. *Implied*. This mode addresses one byte opcode with no operand.

4. *Indexed*. In this mode, the accumulator accesses the value in the address in the operand field, *plus* the value in the X or Y register. Address + X/Y register value = Address. Mode is signaled by ,X or ,Y. (–X or –Y are used in the *RUN* assembler.)

Printing Your Source Code

Now that the source code is getting longer, it might be a good idea to start printing it out. This is especially useful for debugging your programs. On your *RUN* assembler, files are saved both as PRG and SEQ files. The object code is the PRG file, and the source code is the SEQ file.

The following program will print your source code from files made with the *RUN* assembler. (If you have a commercial assembler, use its printing function. For example, on the Merlin Assembler, PRTR4 will turn on your printer. Then an L or ASM command from the editor will list it for you.)

```
10 PRINTCHR$(147)
20 DIM A$(255)
30 INPUT "FILENAME ";NF$
40 NA$="==="+NF$+"==="
50 NF$="0:"+ NF$ +",S,R"
60 OPEN9,8,9,NF$
70 INPUT#9,A$(C)
80 PRINT A$(C)
90 C=C+1
100 IF ST=0 THEN 70
110 CLOSE9
120 OPEN4,4
130 PRINT#4,NA$
140 PRINT#4
150 FOR X=0 TO C-1
160 PRINT#4,A$(X)
170 NEXT
180 PRINT#4
190 CLOSE4
```

That's all for now. Next month we'll discuss branching and looping. Combined with indexed addressing, they'll enable you to do just about anything you want very quickly.

Assembler of the Month

MACHINE LANGUAGE DEVELOPMENT SYSTEM

(100 Graydon Hall Drive, Suite 2301, Don Mills, Ontario, Canada M3A 3A9.)

This month's assembler is an editor/assembler/monitor package from Canada that can be used on either the VIC-20 or C-64. The editor and assembler are not co-resident, since they both load at $A000. The assembler reads text files created with editor, supports macros, error mes-

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sages, menu selection of editor, assembler or monitor, non-co-resident monitor and built-in copy program for providing backup.

Questions and Answers

Q: What is the best assembler to use when you're getting started?

A: I've found that discussing the relative merits of assemblers is like arguing over religion and politics. Whatever position you take, you'll get an argument. The *RUN* assembler was made for beginners. It was designed for ease of learning, and it is a good way to find out if assembly language programming is your cup of tea.

However, as you program more and more on your own, you will want to get an assembler with an editor, macros and other built-in goodies. My own preference leans toward simple-to-use assemblers that load the editor, assembler and monitor in one single program and save programs as PRG files.

Q: Why bother with hexadecimal numbers? From Basic, all values have to be entered as decimal, and both decimal and hexadecimal numbers work just fine from an assembler.

A: In the next installment of this column, we'll be doing more with indexed addressing, incrementing the address we use as an index. Since the values are "stored" in groupings that make more sense in hexadecimal, in the long run it is simpler to use hexadecimal values.

For example, let's say you increment the value in an address. When that value reaches $FF (255), it "turns over" and starts again, just as the decimal value 99 is "turned over" when 1 is added to it. This is illustrated in the following example.

Decimal

```
00 99 <— Increment by 1
01 00
```

Hexadecimal

```
00 FF <— Increment by 1
01 00
```

R

William B. Sanders (8982 Stimson Court, San Diego, CA 92129), is author of Assembly Language for Kids: Commodore 64 *and* Elementary Commodore 64.

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Telecomm

On-line with QuantumLink

By MARGARET MORABITO

Find out about Commodore's new information network—QuantumLink—which is packed with information and services completely tailored to its huge base of Commodore computerists. Also, here's an update on the general-interest utility, Delphi, which has brought on board a special-interest group, the Flagship Commodore.

Commodore has been a leader in providing high-quality computer products at an affordable cost. The production and sales of its three top-selling modems have given Commodore computer owners access to thousands of on-line services.

The VIC Modem 1600 was the first breakthrough in bringing telecommunications into the home. It was followed closely by the Auto-Modem 1650 and then, last year, the Modem/300 1660. Soon, the 1200-baud 1670 Modem/1200 will be for sale. All four of these modems have sold for less than half the competition's price.

Commodore's 1200-baud modem, for less than $200, will be another breakthrough for the small-business and home-productivity user. Until now, you would have been paying $400–$500 for a 1200-baud modem.

Commodore is one of the top modem producers in the world, with well over 250,000 of its modems in U.S. households and businesses. It is not surprising, therefore, to see Commodore take another major first step in the telecommunications field.

Commodore has recently introduced an on-line network that is totally tailored to the huge base of Commodore computerists, including the new C-128 and Amiga owners.

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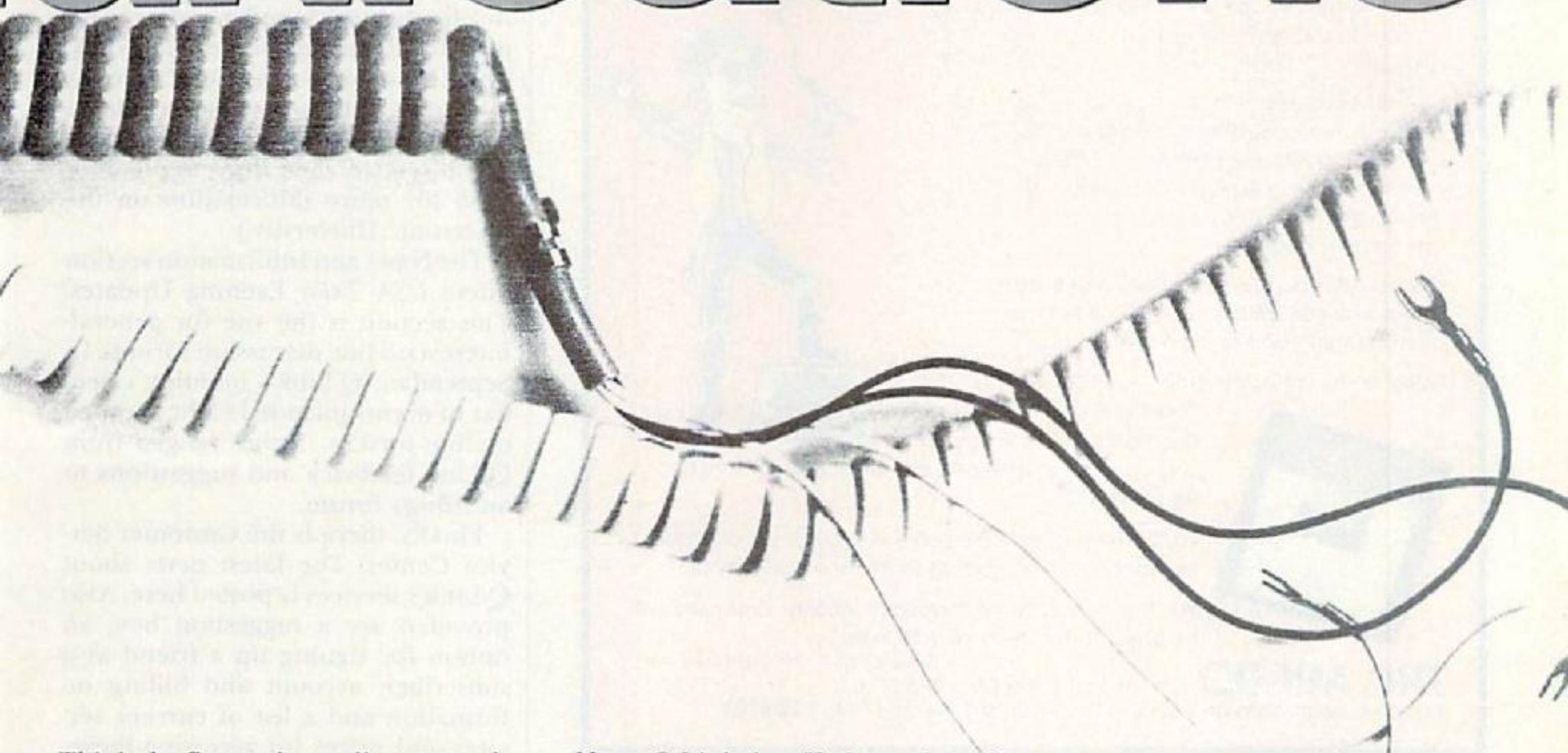

This is the first major on-line network created by a computer manufacturer to serve its own computer base. (In 1986, other popular computers will be served by this network.)

The new network is called QuantumLink (Q-Link), and it has been set up by Commodore Business Machines and Quantum Computer Services. Q-Link looks like a blend of PlayNet, CompuServe's Commodore Information Network and more.

Q-Link is designed to be competitive as a stand-alone on-line network. Its goal is to provide ease of use for new telecommunicators, flexibility for more advanced users and low prices for everyone.

Let's take a look at what this new on-line service offers you and how you can subscribe.

What's on Q-Link?

One of the mainstays of Q-Link is the huge amount of information that has been gathered over the years on CompuServe's Commodore Information Network (CIN). In the past, Commodore modems have offered a free subscription to CompuServe, with the recommendation to join CIN. Because of this, CIN is one of the two largest on-line special-interest groups (SIGs) on CompuServe.

Now, Q-Link is offering selected information from CIN, but under a modified menu and via a different on-line format. CompuServe will still retain a Commodore SIG, but it will be different from CIN.

The new CIN section on Q-Link offers the Commodore Computer Tutor, the Weekly Review, Commodore Helpline, User Group Meeting Information, Information About Other Computers and the Commodore Exchange.

One of the new features on CIN is the Weekly Review, which provides an overview of all the noteworthy news items and new programs added to the SIG each week. The Commodore Exchange is the message center where you can share information about your Commodore computer.

There are seven additional sections on Q-Link's Main Menu. The Commodore Software Showcase lets users preview commercial software for their Commodore computers. There are Software Catalog, Software Previews, Software Exchange and File Transfer options.

The Software Catalog lists and describes 2600 commercial programs. (This is beneficial for those who want to find software for a particular subject area.) The Software Preview lets you preview commercial programs. The Software Exchange is for uploading and downloading public domain software. The File Transfer section is for the private exchange of large documents and programs.

Q-Link also offers the People Connection. This section is set up for on-line chatting with other subscribers. In addition, there are electronic mail services.

People Connection also provides a major section devoted solely to telegaming. On-line entertainment has become a prime focus in several on-line networks, and Q-Link subscribers may participate in games for the C-64, C-128 and, in the near future, the Amiga.

(See *RUN*, August 1985, for a look at PlayNet and People/Link, two entertainment networks.)

Another section on Q-Link is called Just For Fun. This section holds contests and trivia quizzes, as well as entertainment news in the form of movie reviews, soap opera summaries, Hollywood Hotline reports and RockyNet Music news.

Q-Link offers on-line shopping, too. The Shopping Center holds a Software Finder, Music Finder, Book Finder, Newsstand and Comp-U-Store On-line. Advertised as coming

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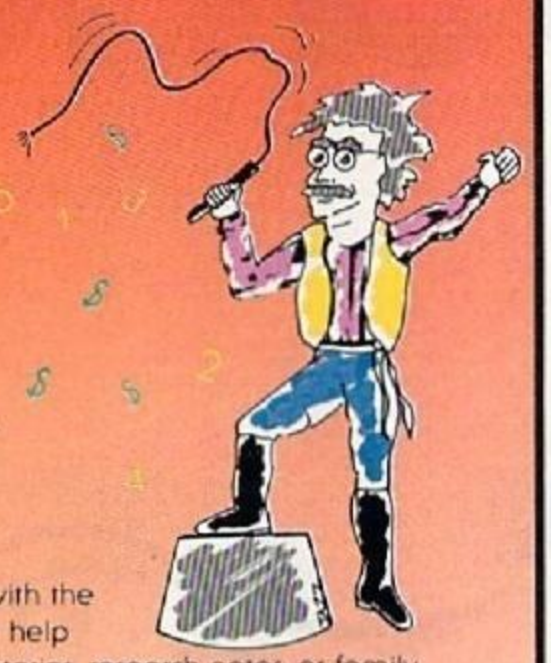

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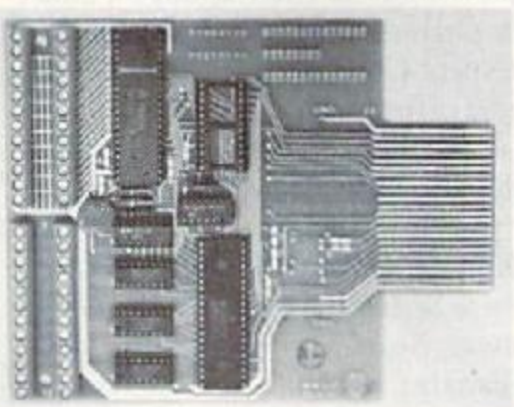

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Also offered on Q-Link is a Learning Center that holds the American Academic Encyclopedia and the Electronic University Catalog. American Academic Encyclopedia is offered on many of the major on-line networks. The Electronic University Catalog is a listing of all the courses available from TeleLearning's on-line educational service. (See *RUN*, September 1985 for more information on the Electronic University.)

The News and Information section offers *USA Today* Evening Updates. This section is the site for general-interest on-line discussion forums. In September, Q-Link's monthly calendar of events included eight planned on-line forums. Topics ranged from Q-Link feedback and suggestions to an Amiga forum.

Finally, there is the Customer Service Center. The latest news about Q-Link's services is posted here. Also provided are a suggestion box, an option for signing up a friend as a subscriber, account and billing information and a list of current services and prices for accessing these.

You may recognize some of these offerings; several are also offered on other on-line networks. Q-Link is not selling just Commodore-specific information; it is also accumulating a hefty amount of standard features offered on other major networks, like CompuServe, Delphi and The Source. Q-Link is actually providing a PlayNet-like version of these major on-line networks. As a matter of fact, Q-Link is using the same basic software format used by PlayNet.

The Medium

Q-Link is software specific. This means that you will need a copy of its software in order to log on. As with PlayNet, you will get a disk that lets you easily log onto the network and take advantage of the Commodore's color and sound.

I did not receive a Q-Link software disk in time for this article, but I did see a prototype of this software demonstrated at the MARCA (Mid-Atlantic Regional Commodore Association) convention in late July.

When I first saw the prototype, I thought it was PlayNet. There are striking similarities to the PlayNet software, but I have been told that Q-Link software will be more flexible than PlayNet and will allow more user-interaction.

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The database section and discussion forums are slightly different than PlayNet's. Also, Q-Link provides fast-load functions in its software, so initial access time is only one minute, and movement from one menu section to another is only five to ten seconds. This is significantly quicker than PlayNet's.

Q-Link is using UniNet for most of its telephone-access network. Telenet and Tymnet numbers are provided for certain locations where UniNet is not available. For most users, calling Q-Link will be a free call; however, those of you who live in rural areas will probably be making a long-distance call.

What It Costs

QuantumLink membership is now being offered free to new Commodore modem buyers. Commodore modems will no longer hold subscriptions to CompuServe and the Dow Jones News Retrieval.

Instead, they will hold a disk that holds Q-Link software, one free month of service and an additional general-purpose terminal program that will allow communication with major networks and local bulletin boards. The general-purpose terminal promises to be an improvement over HiggyTerm, which is currently bundled with the Modem/300.

If you already have a modem, you can subscribe to Q-Link and receive its terminal software free. This offer is good until December 31.

You can register on-line for Q-Link service and software by calling 800-833-9400. Once you've made a connection, press the return key twice. You will then be given the option to provide your name and billing information. Within several weeks, you will be receiving the new software.

After December 31, modem owners can buy Q-Link subscriptions and software for $25.

Q-Link is set up on a monthly subscription basis. After your first free month, you will have a $9.95 monthly fee. This gives you free access to most of Q-Link's services; however, as with most on-line networks, there are certain services that will cost you extra, namely, six cents per minute. The first hour per month of surcharged service access is always free.

Q-Link is available from 6 PM to 8 AM on weekdays, and 24 hours a day on weekends. For more information, contact Quantum Computer Services, Inc., 8620 Westwood Center Drive, Vienna, VA 22180; 703-448-8700.

Delphi Update

Since I last reported on Delphi (see *RUN*, July 1985), the service has undergone some changes. For one, Delphi has replaced its old software with a new, more streamlined system. There has also been a major reorganization of services on Delphi. As part of that shift, Delphi has added a brand new service that will be of great interest to Commodore computerists.

A special-interest group (SIG) called the Flagship Commodore is now on Delphi. This SIG started late last spring and is under the management of Deb Christensen, who is a former SYSOP on CompuServe's Commodore Information Network.

Ms. Christensen brings to this new SIG several years' experience in on-line networks and SIG management. She has already generated a lot of activity on the Flagship Commodore, making this SIG a gathering area for many well-informed Commodore computerists. Intermediate and advanced users are at home on the Flagship Commodore, and beginners are welcome.

Flagship Commodore contains a wealth of information. Users have a well-developed forum for on-going discussions. Delphi uses threading, a method of tracking forum messages by topic and for informing you whenever you have a specific reply to a bulletin that you have posted. This threading is one of the strengths of an information network, and it makes the discussions on the Flagship both personal and stimulating.

The Forum is a discussion center where, at times, controversy rages. You can ask questions and get answers from some of the most knowledgeable Commodore users around; you can share your own information; and you can gather information about any topic you can think of that's related to your Commodore computer.

The Forum isn't the only active area on the Flagship. In most good SIGs, much of the on-line activity is spent in the databases, downloading public domain software or archived text files gathered from the forums. The Flagship is still fairly new, but it has a steadily growing database section.

The SIG SYSOPs are constantly checking bulletin boards and user's groups for new public domain software, and there is a constant stream of new software that is being sent on disks to the Flagship. This new software is in addition to the hundreds of programs already available in the public domain.

If you have a program that you've written and would like to contribute to public domain, you can log onto Delphi, enter the Flagship and upload your program. All new programs are placed into a special holding area until the SYSOPs have a chance to check them out.

No copyrighted software is accepted, and the SYSOPs try to avoid duplication of topics. Only after a program has been thoroughly tested and approved does it become a part of the on-line database.

In addition to programs, there are also databases devoted to text files. The threads on the forums are periodically gathered together and archived onto a text database. This makes it easy for the occasional user who doesn't have the time or inclination to read through countless forum messages to follow one topic.

You can just enter the database, locate the topic of your choice, download that file and then read all of the messages while off-line, at your leisure. (By the way, the Flagship has a C-128 and an Amiga section for information exchange on these new computers.)

The Flagship Commodore is one example of how valuable SIGs can be to both new and experienced computerists. It provides an open atmosphere for discussion, information exchange and public software transferral.

All of Delphi's SIGs follow a format similar to the Flagship Commodore. They each offer on-line shopping and electronic mail service from within each SIG. This makes it handy, because you don't have to leave your chosen SIG in order to send or read mail, or to browse through a shopping center.

For more information about Delphi and the Flagship Commodore, contact: Delphi, The Flagship Commodore, General Videotex Corp., 3 Blackstone St., Cambridge, MA 02139; 800-544-4005.

The world of on-line activity is growing rapidly. One area now ready for national access is on-line banking. Next month, we'll look at ViewTron and its contributions in providing banking and other consumer services to Commodore computerists. R

Address all author correspondence to Margaret Morabito, c/o RUN *editorial, 80 Pine St., Peterborough, NH 03458.*

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A Cure for the Data Statement Blues

Do your Data statements tell you there are errors in lines that are correct? Now you can get to the real source of these errors and eliminate them quickly.

By DONALD H. GRAHAM

You're running your latest creation (a program that's loaded with Data statements), and suddenly you see this horrible message appear on the screen:

```
?ILLEGAL QUANTITY
ERROR IN 25
```

"Statement 25?" you say. "But that's the statement that reads the data. All it says is READ A. What could possibly be wrong with that?"

Or maybe it happens this way. You type in a program exactly (or so you think), but when you run it, you get this strange message:

```
?OUT OF DATA
ERROR IN 330
```

It's the old data hang-up. The bad piece of data is lost somewhere in that mass collection of Data statements, and the error message tells you that you made a mistake in the Read statement, hundreds of statements away from the real source of the problem.

Great! *Now* what do you do? PRINT A loses its significance, because the variable didn't get filled. And you certainly don't want to proofread all your Data statements! Well, here's what you can do.

In the case of the Out Of Data error, the computer is merely trying to tell you that your program tried to execute a Read command and there was no data left to be read. This is not too serious, since it only means that you've left out one or more pieces of data.

You need to check the allocation of the data and try to find a missing byte or an empty variable. You might also look at your counter value, if you have one. If your Read command is within a loop that executes too many times (even once too many is too many!), then you'll get an Out Of Data error.

You should also be careful not to execute the Read statements more than once. If you do (for example, to play a melody), you must first execute a Restore command. If you don't restore the data pointer before rereading, then the next time you execute the Read command, the pointer will be at the end of your data rather than at the beginning.

Try this to prove an Out Of Data error to yourself. Turn on your computer. Once your screen displays READY, move the cursor up one line and press the return key. You'll get an Out Of Data error, because the computer will have interpreted the Ready prompt as Read Y (remember, Basic ignores spaces unless they are in quotes), and there was no Data statement to read. Now type:

```
20 DATA 235 {RETURN}
```

Next, place the cursor on the Ready prompt and press the return key. Now you don't get an error, because there was data available to be read. As a matter of fact, if you type

```
PRINT Y
```

you'll see the value of Y, 235!

The C-64's central processing unit uses about 830 memory locations to keep track of what's going on in the machine. These locations are referred to as the operating system. To use these locations, you must know what they are, where they are and how to interpret their contents.

In the case of our current dilemma, the Bad Data error, you can type, in the Immediate mode:

```
PRINT PEEK(63) + PEEK(64)*256
```

These two locations (63 and 64) contain a hexadecimal representation (in standard low-byte/high-byte format) of the current Data statement being read. When you hit the return key, your screen will display the number of the last Data statement that the computer was reading before things went awry.

Now you need only list that statement and inspect it for a typo, or a letter where a number belongs, or a value that's too large, or even the elusive double comma.

One final tip: In Basic, don't ever use a comma to denote place value (such as 36,285). If you do, the computer will not treat that comma the way you do. In this example, the computer will either ignore the 285 or (if it's part of a Data statement) will read the 36 as one number, then read the 285 as another number on the next Read command.

So, there you have it! I hope this article has helped to cure your Data statement ailments. R

Address all author correspondence to Donald H. Graham, 125 Cedar Hill Road, Baltimore, MD 21225.

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CP/M and the C-128

By ALEX LANE

Are you familiar with CP/M? Find out what it's all about and how the C-128 opens up a whole new world of software for Commodore users.

One of the major features of Commodore's new C-128 computer is its ability to operate in the CP/M mode. CP/M stands for Control Program for Microprocessors, and it's the world's most popular operating system for eight-bit microcomputers.

I can hear some of you hard-core Commodore owners saying, "Hmph! If CP/M is so popular, how come I never read about it in *RUN* before?"

The answer to this question boils down to the fact that CP/M will only work on a microcomputer that is built around an 8080 microprocessor, or one of its more advanced relatives, the 8085 or Z-80. (That's why the Commodore 64, which uses a 6510 microprocessor, can't run CP/M without a hardware attachment that plugs into the back of the machine.)

To date, well over 300 computer manufacturers offer CP/M with their equipment, and new machines are making their debut every day, despite the popularity of IBM-compatible computers and operating systems. In fact, CP/M is so popular that even "advanced" computers like the IBM PC and the Apple Macintosh have options available that let them run CP/M.

How It All Began

The history of CP/M began in 1973 when Gary Kildall, who had earned a Ph.D. in computer science, was working as a part-time consultant to Intel, then and now a leading microchip manufacturer.

Intel, which had been using punched paper tape as a storage medium for software development, wanted a floppy disk interface so that the then new eight-inch Shugart floppy disk drives could be used with Intel's development system for the then state-of-the-art 8080 microprocessor. Kildall was hired to write a high-level software development language for this system.

Kildall used his software development language—called PL/M (Programming Language for Microprocessors)—to write an early version of the CP/M disk operating system, but Intel decided not to adopt CP/M. The company had already started developing its own operating system, called Isis.

By 1975, several small companies were beginning to market 8080-based microcomputer systems to hobbyists. However, many of these companies were faced with having to write a disk operating system so the computers could be used with disk drives.

Among the companies that were first able to get their systems to market were Tarbell Electronics and Digital Microsystems; both companies had licensed CP/M from Kildall's newly founded Digital Research, Inc., and were shipping CP/M with their hardware. Thousands of hobbyists bought the Tarbell S-100 disk controller card (which came with CP/M) and interfaced it to computers having names like Altair, Poly, Vector and SOL.

The rapidly increasing base of CP/M machines made it feasible for software developers to write powerful programming tools and applications programs that would run on a number of different microcomputers with little or no rewriting of code from machine to machine. The development of such software in turn encouraged hardware manufacturers to design and market CP/M-based machines.

Another important development in CP/M history was the formation of first one, and then two, large user's groups. These groups enabled microcomputer users to develop a number of refinements in the system and to solve many implementation problems.

Members also began to place their software efforts in the public domain, with programs ranging from housekeeping utilities and games to word processors, programming languages and telecommunications programs. To date, the CPMUG (CP/M User's Group) and SIG/M (Special Interest Group for Microcomputers) have accumulated several hundred disks of public domain software.

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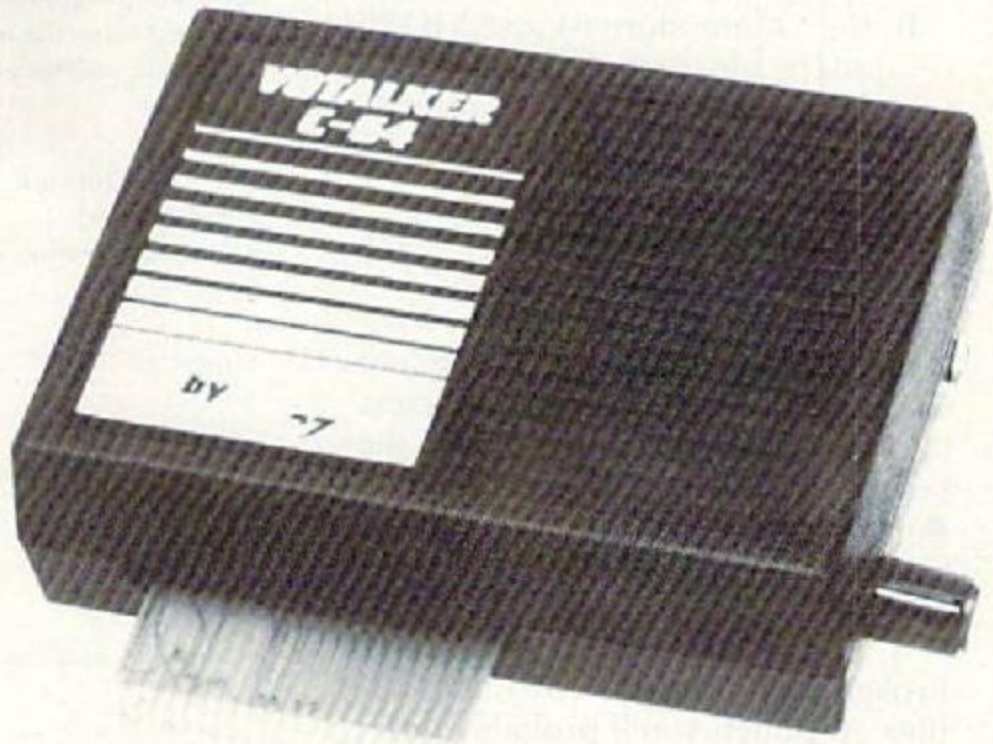

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What is CP/M?

CP/M is a single-user, single-task operating system for microcomputers. This means that only one person at a time can use the system to run only one program. "Okay," I can hear many fellow Commodore owners saying, "but what's an operating system?"

An operating system (or OS, for short) is a program that manages computer system resources; things like memory, disk drives, the screen and keyboard (together called "the console," even if physically separate) and the printer and communications ports. In other words, it's a master program that lets you, the user, run other programs.

In the Commodore 64 and VIC-20 computers, for example, the OS consists of three separate, yet interrelated, programs:

- the Basic interpreter, which is a programming language that performs calculations and manipulates data.
- the Kernal, which takes care of system I/O (for example, opening and closing of files, printing characters to the screen, getting input from the keyboard, and so on).
- the screen editor, which intercepts keyboard input and decides what to do with it.

A typical CP/M system can also be broken down into three distinct modules. Although you'll probably never have to poke around inside of them, it's good to know what they are, if only to understand what's being said when you run across a roomful of grizzled CP/M hackers swapping war stories.

The Basic input/output system (BIOS) is a hardware-dependent piece of software that provides the interface between a particular system's nuts and bolts and the rest of the CP/M operating system. This design concept—having a uniform interface despite the actual hardware variations—is the main reason CP/M has been implemented on such a broad range of machines.

In turn, the main module of the CP/M system is the Basic disk operating system (BDOS). It manages the memory, the processor and input/output (or I/O, for short) for the entire microcomputer system. The advantage of using the BDOS is that when a program calls for a file to be opened, say, on a disk, the same results are produced whether you're using a C-128, a Kaypro or an Altair.

Finally, the console command processor (CCP), which, under CP/M

Partial List of CP/M Software For the C-128

It would be fruitless to try to publish the titles of all the commercial software available to users of the CP/M operating system. Such a list would not only be large, but it would require frequent updates, as some packages (such as the now defunct VisiCalc) are retired, and others (like Write-Hand-Man, listed below) are introduced.

The following list of software packages represents an abbreviated cross-section of available programs. Since selection of one title over another is, inherently, a matter of personal taste, the reader should note that the absence of particular titles is not intended as a value judgment.

Multiplan
Microsoft/Hesware
206-828-8080
Second-generation spreadsheet.
$275

SuperCalc 3
Sorcim
408-942-1727
Spreadsheet with modeling and graphics.

DBase II
Ashton-Tate
213-930-1289
Relational database management system.
$700

Quick Code
Fox and Geller Associates
201-882-0121
Program generator for DBase II.
$300

Write-Hand-Man
Poor Person Software
415-493-3735
A "pop-up" utility that includes notepad, phone book, calendar and communication program, among others.
$50

WordStar
Micropro International Corp.
415-499-1200
Long-time bestselling word processor/text editor.
$500

Spellstar
Micropro International Corp.
415-499-1200
Spelling checker.
$250

Spellguard
Sorcim
408-942-1727
Spelling checker.
$100

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Grammatik
Aspen Software Company
???
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$??

Word Index II
Borland International
408-438-8400
Numbers, cross-references and indexes lengthy documents.
$200

Mix Editor
Mix Software
214-783-6001
General-purpose text editor that allows split-screen editing and supports macro commands.
$30

Fancy Font
Softcraft, Inc.
608-257-3300
Printer enhancement software soups up dot-matrix printer output.
$180

Crosstalk
Microstuf, Inc.
404-952-0267
Communications program.
$200

Mite
Mycroft Labs
904-385-1141
Communications program.
$150

Turbo Pascal
Borland International
408-438-8400
Pascal programming language.
$50

Abstat
Anderson-Bell Co.
303-275-1661
Statistical applications program.
$400

Power!
Computing!
415-567-1634
Collection of system utilities.
$170

Smartkey
Heritage Software
213-737-7252
Keyboard macro utility, allows keyboard redefinition.
$65

Macro-80
Microsoft
206-828-8080
Macro assembler.
$250

Aztec C II/PRO
Manx Software Systems
201-530-7997
C language compiler.
$350

Plus, can be swapped into and out of memory as needed, provides an interface between the machine and you, the user. Whatever you type into your computer is digested by the CCP, which in turn decides what needs to be done.

In use, the BDOS and BIOS are loaded into high memory in the computer. In addition, the first 256 bytes of memory (the zero-page) are reserved by CP/M for itself. Finally, the memory area between the zero-page and the operating system is called the transient program area, or TPA. When you want to run a program, the code is loaded into the TPA and executed.

As you can see, there are some parallels between the Commodore OS and the CP/M operating system. CP/M's CCP corresponds roughly to Commodore's screen editor; both try to decode keyboard input. The Commodore Kernal's job of managing system I/O is roughly equivalent to the job done by the combination of CP/M's BIOS and BDOS.

There are, however, some differences between the two systems. First, although the Commodore OS includes a programming language (Basic), CP/M does not. In fact, there are only a half dozen or so built-in commands that make sense to the CCP; any other input will result in an error message or cause the system to load and execute a transient command or disk file.

Second, the Kernal does the job of both BIOS and BDOS. Recall that the CP/M, unlike the Kernal, splits up the machine-dependent routines into the BIOS, thus allowing CP/M to be used with many different machines (including systems that are built with equipment bought from different manufacturers).

On a practical level, it's important to remember that CP/M is not a programming language, even though the built-in and transient commands do have their own syntax. CP/M is, by and large, also transparent to the user, so you don't have to be a programmer to use it.

CP/M Plus and the C-128

CP/M has undergone quite a few changes over the years. The version that comes with the C-128—CP/M Version 3.0 (also called CP/M Plus)—is a radical enhancement of its widely distributed predecessor, CP/M Version 2.2.

Although much of the added horsepower of CP/M Plus is intended for

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programmers and is invisible to the casual user, it's interesting to note that with CP/M Plus on the C-128, you'll have the ability to see and set the date and time, type in multiple commands on a line, use multiple banks of memory (prior versions were limited to 64K of memory) and redirect input and output (allowing you, for example, to get keyboard input from a disk file).

In addition, you'll be able to assign passwords to a disk drive or disk file, so only you can access them, and to set up files so that their contents can't be accidentally changed.

Commodore has also added to CP/M Plus on the C-128 a number of its own enhancements, including the ability to redefine keyboard keys to generate codes or functions and the capacity to make the screen imitate various popular terminals.

And yet, despite all these differences, CP/M Plus on the C-128 will run most of the hundreds of CP/M programs written for CP/M 2.2 and its earlier versions.

Why Run CP/M?

The one major reason to run CP/M is that several hundred megabytes of useful, powerful programs have been written for CP/M machines, and much of this software is either inexpensive or free!

There are public domain accounting packages, database managers, word processors and spreadsheets. There are hundreds of useful disk utilities available, one to match just about anyone's taste. There are thousands of tutorial files available, with information about everything from telecommunications to artificial intelligence.

Are you interested in broadening your knowledge of programming languages? You can try out your knowledge of Pascal, Fortran and Cobol, or get involved with more exotic languages like C, Forth, Lisp, Prolog or Stoic for little or no cost.

And don't forget games! Public domain adventure games; games of skill, like chess; games of chance; games to help you practice Morse code or navigate the ocean; all sorts of games.

Is CP/M for You?

Despite its wide acceptance and use, some "experts" complain that CP/M has some drawbacks for the average personal computer user with limited computer knowledge.

The main objection—that CP/M has a complicated command syntax—does pose an obstacle to new users. At any rate, the command syntax (which does look a little intimidating at first glance) is easily learned. In addition, CP/M Plus addresses the problem of trying to remember the right command at the right time by providing a Help command that displays information on how to use the CP/M Plus commands.

Another related objection is the claim that CP/M forces you to get "into" the machine by having you worry about things like "physical" and "logical" units, where the system resides in memory, and other technical concerns. Not so. Although some undoubtedly consider it a plus to get elbow-deep in bits and bytes, I've known many CP/M users whose most technical accomplishment has been to format a disk, and they're dedicated users, too!

In short, nobody should feel that CP/M is too complicated to learn. With the arrival of CP/M in the C-128, the Commodore user can discover a microcomputing world that has been hidden until now. R

BDS C Compiler
BD Software, Inc.
617-576-3828
C language compiler.
$150

C/80
Software Toolworks
213-986-4885
C language compiler.
$50

Waltz Lisp
Procode International
800-547-4000
Lisp programming language.
$170

Nevada Cobol
Ellis Computing
415-753-0183
Cobol programming language.
$30

Forth
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213-306-7412
Forth programming language for 8080 or Z80.
$100

Personal Pearl
Pearlsoft
503-682-3636
Program generator.
$295

Disk Doctor
Supersoft, Inc.
217-359-2112
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Uniform
Microsolutions
815-756-3411
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PRE-PUBLICATION ANNOUNCEMENT

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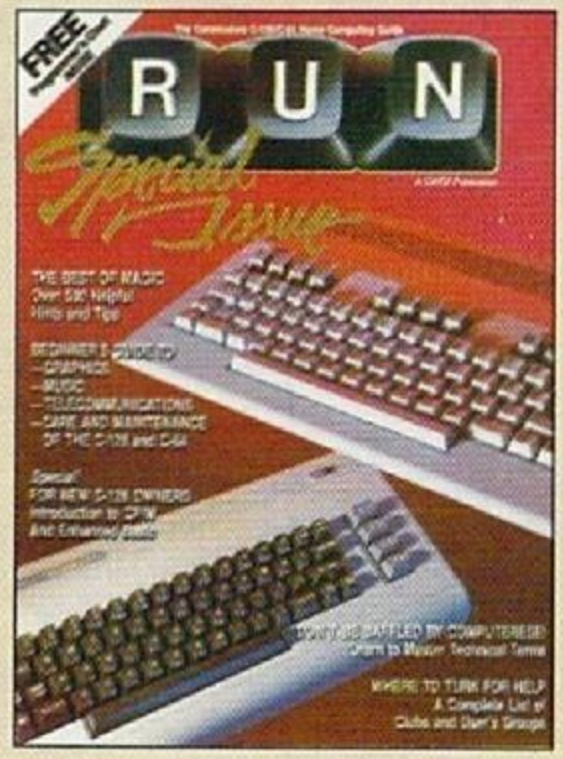

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Programed by Jim Drew

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Music Shop	?	105 sec.	105 sec.*	105*	**21 sec.**
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	**68 sec.**
On-field Football	?	149 sec.	66 sec.	63 sec.	**56 sec.**
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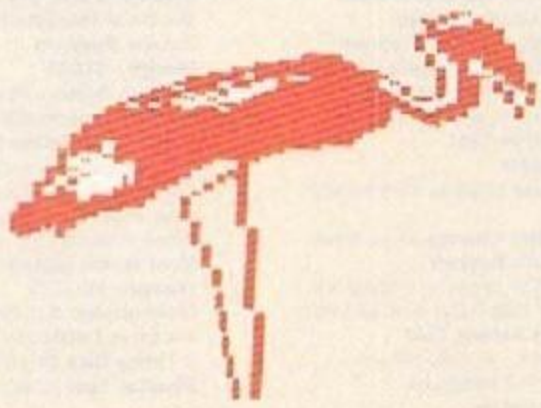

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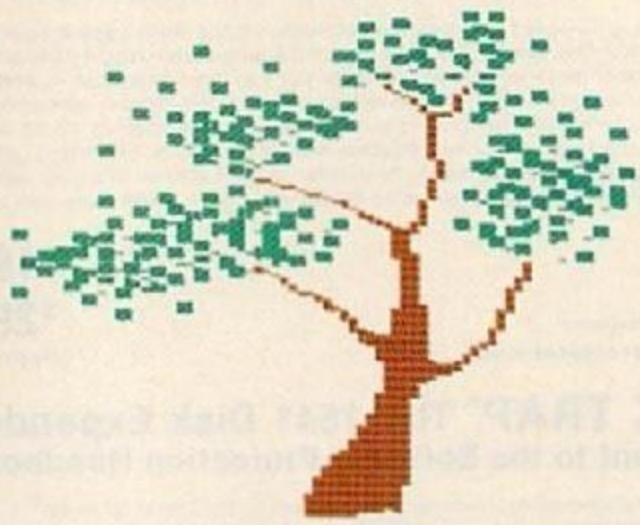

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Instant Recall

By RICK LOCKETT

Here's a program that should have been included in your Commodore user's manual. Designed to work on both the C-64 and VIC-20, Instant Recall is a short (only six lines) and speedy data-access program.

Client on the phone? With Instant Recall, you can have his file on the screen by the time he has told you his name. The program also saves you a lot of unnecessary typing.

For example, if your client's name begins with S, simply type S and hit the return key. Every name in the file beginning with S will be displayed. If you type SMI, then every name that begins with SMI will appear.

It is seldom necessary to type in more than the first few letters of an item in order to find a particular entry, and this is one reason for the program's speed. This process is the same whether you're using Instant Recall for a client file, as an inventory or for keeping track of recipes.

If you own an unexpanded VIC-20, you'll especially appreciate the mini-byte that Instant Recall puts on your FRE(X). You need that memory for information, rather than for a program that sorts and retrieves information.

Conserve memory with this quick and easy miniature information retriever.

The Program

Here's the simple version of Instant Recall:

```
2 RESTORE:INPUT A$
3 B=LEN(A$):READ B$
4 IF LEFT$(B$,B)=A$ THEN PRINT B$
5 IF B$="0" THEN GOTO 2
6 GOTO 3
999 DATA 0
```

Now enter the following sample data entries and run the program. You'll quickly discover its advantages.

```
10 DATA CARR TERRY – UNIVERSE 3 –
   ANTHOLOGY – 1973
11 DATA CLARKE ARTHUR C –
   RENDEZVOUS WITH RAMA–
   NOVEL – 1973
12 DATA CAMUS ALBERT –
   THE STRANGER – NOVEL – 1942
13 DATA CORDER JIM W – HANDBOOK OF
   CURRENT ENGLISH – REF – 1981
14 DATA COPPEE HENRY –
   ELEMENTS OF LOGIC – REF – 1857
```

These entries are titles of books from my shelf and should give you a good idea of how Instant Recall works. (If you happen to own a bookstore, you can readily see how quickly you could check your inventory for a customer.)

The refinements that might be added to this program are endless, as are its potential applications. To save bytes, you should use some abbreviations in your data entries. Also, it is a good idea to include (somewhere) the line number, so that you can easily update or eliminate an entry. Since the computer has a key that will clear the screen, I didn't include a CLR command in the program. Since you really can't tell how long you may want the display to remain on your screen, it's best to simply avoid it in the program. R

Address all author correspondence to Rick Lockett, Box 439A, RD #6, Lewistown, PA 17044.

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Wedgemaker

Why settle for Commodore's wedge? Now, you can easily create your own tailored wedge, which holds only those commands you use most.

By ALEJANDRO A. KAPAUAN

Wedgemaker is a utility program that allows you to add your own custom Direct mode commands to Basic without having to write a single line of machine code. Since you implement the commands in the Basic language itself, you can quickly and easily add new and arbitrarily complex functions that would normally take a lot of time to write in assembly language.

I'll examine a sample Basic program and show you how to convert it into a useful disk wedge. But first, let's go through the step-by-step procedure in using Wedgemaker.

Before anything else, you'll need Wedgemaker itself. Type in Listing 1 very carefully, check your work and save the program on disk with the name Wedgemaker.

Listing 2 is a sample program containing a few useful disk and number-conversion utilities. This program will serve as the sample wedge. Later, you may utilize it as the basis for your own personally designed wedge. For now, however, I suggest that you type it into your computer exactly as shown, without modifications. Again, exercise care in entering it and save it on disk with the name Utilities.

There are nine program segments in Listing 2. Line 20 is the start of the segment that reads the disk error channel. With the program in your computer, try typing in GOTO20. That section of code will run, and the message from the disk will be printed to the screen.

A decimal-to-hexadecimal number-conversion program begins at line 60, while a hexadecimal-to-decimal program begins at line 110. These lines prompt you for numbers to convert; to discontinue these prompts, respond only by pressing the return key. Try typing in a GOTO60 or GOTO110 to run the programs.

Similarly, line 160 starts a routine that initializes the disk drive. At line 200 and line 240 are programs that scratch and rename disk files. Line 280 is the beginning of a program that formats a new disk, while at line 330 is a program that prints the disk directory to the screen. All these program segments are prompt-driven. Using them is much easier than having to remember a lot of lengthy disk commands.

Finally, at line 530 is a program that will later serve as a Help routine. It prints a list of commands that will be available with the wedge. You'll see later how nicely this works out.

Wedgemaker at Work

Now you'll perform some magic. Load the program called Wedgemaker and run it. It will print a banner line and prompt you with the question

PROGRAM FILE?

With the Utilities disk in your drive, type UTILITIES and hit the return key. Wedgemaker will now read the directory entry for the file and determine the program's length, in blocks. Each block constitutes approximately 256 bytes. The length of the program will be reported, then you'll be asked the question

#DATA PAGES?

Wedgemaker is asking you how many blocks to reserve for variables, arrays and strings in the wedge program. For the sample program, two blocks are more than sufficient. Enter the number 2, then hit the return key. For your own wedge program, you'll have to estimate the disk storage space needed. I'll give you a procedure to do this later.

Wedgemaker will then lower the Basic top-of-memory pointer, load the program in high memory and relink the pointers in the program for its new location. Next, it will add a machine language program that will manage the Basic wedge program.

You will then be asked to define the commands you want to add to Direct mode Basic. For the sample program, nine new commands will be defined, one corresponding to

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each of the program segments previously described. For each command, you enter a command name and a line number. As a guide, the following table lists the command names and their corresponding line numbers for the sample program.

Command	Line
ERR	20
HEX	60
DEC	110
INIT	160
SCRATCH	200
RENAME	240
HEADER	280
DIR	330
HELP	530

The names I have given the commands are arbitrary, so you may give them other names. However, for the sake of consistency with this article, I suggest you use those in the table for your first try.

When you are asked for command 1, enter ERR and hit the return key. When you are asked for the line number, enter 20 and hit the return key. Enter the other commands and line numbers listed in the table. When you are done, just hit the return key when you are asked for the next command. You will be asked the question

OKAY (Y/N)?

If you made any mistakes in entering the commands or line numbers, then answer N, and you can enter them again. If everything is satisfactory, then answer Y.

Now, insert into your disk drive the disk on which you want to save the wedge program. You will be asked for the name you want to give the wedge. For our example, let's just call it Wedge. Type WEDGE and hit the return key. Two files will be saved to disk. One will be called WEDGE.W, which is the actual wedge program file. The other, called WEDGE, is a command file that will help you load the wedge easily. It is in this latter file that Wedgemaker will report the commands it has placed.

Once Wedgemaker has created your wedge, you're ready to use it. With the disk containing the wedge in your drive, enter the command

LOAD"WEDGE",8,1

This will then load the binary file WEDGE.W into memory and perform the Pokes necessary to protect it and install the wedge. When the wedge is loaded, try out your new commands.

You must type in the commands

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starting at the first column of the line, and you cannot combine them with any other Basic statement on the same line. Try typing in the Help command. A list of available commands will appear on the screen. Try the other commands. Notice that if you type in the List command, no program will be listed. As far as Basic is concerned, the wedge program does not exist. You can even load into your computer some other Basic program, and the "invisible" wedge Basic program will still be there.

At this point, you will notice that you have less free memory than normal. This is because the top-of-memory pointer has been lowered to protect the wedge program.

Hints

There are three peculiarities about the way the Wedgemaker program works. First, for the wedge to work, you must begin your program with a REM statement as in the program in Listing 2. You cannot use this line as the start of any command definition. Look back at the table of commands and note that the first command is ERR, which starts at line 20.

Second, variables within the wedge Basic program retain their values after Wedgemaker executes a command. Many applications where one command may require the result of a previous command can take advantage of this feature.

Third, there is a limited table space available in Wedgemaker. Each of the defined command strings can be no longer than 256 bytes. This limits you to only about 23 or so commands, depending on the length of the command names.

Estimating Disk Storage Space

To determine the number of blocks needed by your own wedge program for variables, just run the routine you think uses the most strings or variables. Immediately after that, check how much memory you have left by typing PRINT FRE(0). Then clear the variables by typing in the CLR command. Type PRINT FRE(0) to check your free memory again. The difference in these two numbers is the number of bytes used by the variables. To convert to blocks of memory, just divide by 256 and round up to the next larger integer. It is a wise idea to add one extra block to prevent any Out of Memory error while a wedge routine is running.

Finally, I'd like to say that Wedgemaker is not limited to making just wedge programs. You can string several Basic game programs together, then use Wedgemaker to turn this large program into a game wedge. Amaze your friends by simply typing in the name of a game to get it running. Or use Wedgemaker to develop built-in Basic database commands. Wedgemaker's applications are virtually limitless, so let your imagination run wild. R

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Listing 1. *Wedgemaker program.*

Note: VIC-20 users disregard the checksums. Do not type in the REMs at the end of the program lines.

```
10 PRINT"{SHFT CLR}{CTRL 9}*** WEDGEMAKER *
   **":PRINT"INSERT PROGRAM DISK"  :REM*102
20 Z$=CHR$(0)                      :REM*16
30 F$="":INPUT"PROGRAM FILE";F$:IFF$=""THEN
   30                              :REM*218
40 CLOSE5:CLOSE6:CLOSE15:OPEN15,8,15:OPEN5,
   8,5,"0:"+F$+",P,R"              :REM*240
50 GOSUB730:IFER<>0THENCLOSE5:CLOSE15:GOTO3
   0                               :REM*84
60 GET#5,A$:GET#5,B$:POKE828,ASC(A$+Z$):POK
   E829,ASC(B$+Z$):CLOSE5          :REM*50
70 OPEN6,8,0,"$0:"+F$:GET#6,A$,A$,A$,A$,A$,
   A$                              :REM*156
80 GET#6,A$:IFA$<>CHR$(34)THEN80   :REM*54
90 GET#6,A$:IFA$<>CHR$(34)THEN90   :REM*80
100 GET#6,A$:IFA$=CHR$(32)THEN100  :REM*72
110 GET#6,A$:IFA$<>""THEN110       :REM*48
120 GET#6,A$,A$,A$,B$:L=ASC(A$+Z$)+256*ASC(
    B$+Z$)                         :REM*230
130 CLOSE6:CLOSE15:PRINT"PROGRAM IS"L"PAGES
     LONG"                         :REM*146
140 INPUT"#DATA PAGES";P:P=INT(P):IFP<1THEN
    140                            :REM*216
150 A=831:FORI=1TOLEN(F$):POKEA,ASC(MID$(F$
    ,I,1)):A=A+1:NEXTI:POKEA,0     :REM*64
160 POKE830,L+P+2:POKE56,PEEK(56)-L-P-2:CLR
                                   :REM*12
170 Z$=CHR$(0):P=PEEK(830):F$="":A=831
                                   :REM*60
180 C=PEEK(A):IFC<>0THENF$=F$+CHR$(C):A=A+1
    :GOTO180                       :REM*12
190 PRINT"LOADING "F$              :REM*80
200 OPEN15,8,15:POKE183,LEN(F$):POKE184,5:P
    OKE185,0:POKE186,8             :REM*50
210 POKE187,63:POKE188,3:POKE780,0:POKE781,
    PEEK(55):POKE782,PEEK(56)+2    :REM*78
220 SYS65493:T=PEEK(781)+256*PEEK(782):GOSU
    B730:IFER<>0THENSTOP           :REM*168
230 CLOSE15:PRINT"LINKING "F$:A=PEEK(55)+25
    6*(PEEK(56)+2)                 :REM*174
240 B=PEEK(828)+256*PEEK(829):C=A  :REM*200
250 V=PEEK(A)+256*PEEK(A+1):IFV=0THEN270
                                   :REM*146
260 V=V-B+C:POKEA,V-INT(V/256)*256:POKEA+1,
    INT(V/256):A=V:GOTO250         :REM*149
270 PRINT"APPENDING ML"            :REM*221
280 S=0:FORI=828TO875:READV:S=S+V:POKEI,V:N
    EXTI                           :REM*247
290 IFS<>5045THENPRINT"ERROR IN DATA BLOCK
    1":STOP                        :REM*29
300 POKE842,PEEK(771):POKE873,PEEK(771)
                                   :REM*121
310 C=C-512:S=0:FORI=0TO127:READV:POKEC+I,V
    :S=S+V:NEXTI                   :REM*239
320 IFS<>14688THENPRINT"ERROR IN DATA BLOCK
     2":STOP                       :REM*245
330 S=0:FORI=1TO12:READA:S=S+A:READV:S=S+V:
    A=A+C+1:V=V+C                  :REM*139
340 POKEA,V-INT(V/256)*256:POKEA+1,INT(V/25
    6):NEXTI                       :REM*115
350 IFS<>1949THENPRINT"ERROR IN DATA BLOCK
    3":STOP                        :REM*231
360 POKEC+57,PEEK(771):A=PEEK(770)+256*PEEK
    (771)                          :REM*203
370 POKEC+9,PEEK(A+1):POKEC+10,PEEK(A+2)
                                   :REM*245
380 FORI=105TO128:POKEC+I,0:NEXTI  :REM*151
390 POKEC+105,PEEK(55):POKEC+106,PEEK(56)+2
                                   :REM*147
400 T2=INT(T/256):T1=T-T2*256      :REM*107
410 FORI=107TO111STEP2:POKEC+I,T1:POKEC+I+1
    ,T2:NEXTI                      :REM*161
420 C1=PEEK(55):C2=PEEK(56)+P      :REM*207
430 POKEC+113,C1:POKEC+114,C2:POKEC+117,C1:
    POKEC+118,C2                   :REM*13
440 PRINT"{CTRL 9}DEFINE COMMANDS":PRINT"JU
    ST HIT RETURN TO END":L=1:A=129:REM*255
450 A$="":PRINT"COMMAND"L;:INPUTA$:IFA$=""T
    HEN500                         :REM*67
```

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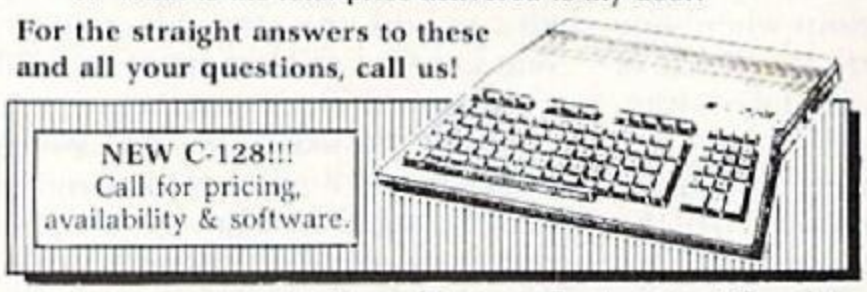

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Listing 1 continued.

```
46Ø INPUT"LINE NUMBER";N:X$=A$+Z$+"G{SHFT O
    }"+MID$(STR$(N),2)+Z$                 :REM*2Ø3
47Ø IFA+LEN(X$)>383THENPRINT"TABLE OVERFLOW
    ":GOTO5ØØ                             :REM*117
48Ø FORI=1TOLEN(X$):POKEC+A,ASC(MID$(X$,I,1
    )):A=A+1:NEXTI                        :REM*91
49Ø POKEC+A,Ø:L=L+1:GOTO45Ø               :REM*215
5ØØ IFL=1THEN44Ø                          :REM*111
51Ø INPUT"OKAY (Y/N)";A$:IFA$="N"THEN44Ø
                                          :REM*65
52Ø IFA$<>"Y"THEN51Ø                      :REM*12Ø
53Ø PRINT"{CTRL 9}INSERT DESTINATION DISK"
                                          :REM*142
54Ø W$="":INPUT"WEDGE NAME";W$:IFW$=""THEN5
    4Ø                                    :REM*5Ø
55Ø W2$=W$+".W":PRINT"SAVING "W2$:CLOSE5:CL
    OSE15:OPEN15,8,15                     :REM*17Ø
56Ø FORI=1TOLEN(W2$):POKE575+I,ASC(MID$(W2$
    ,I,1)):NEXTI                          :REM*246
57Ø POKE183,LEN(W2$):POKE184,5:POKE185,1:PO
    KE186,8                               :REM*15Ø
58Ø POKE187,64:POKE188,2:POKE78Ø,55:POKE781
    ,T1:POKE782,T2                        :REM*174
59Ø SYS65496:GOSUB73Ø:IFER<>ØTHEN54Ø
                                          :REM*164
6ØØ PRINT:PRINTW$" CONTAINS:":X$="LOAD"+CHR
    $(34)+W2$+CHR$(34)+",8,1"+Z$          :REM*14
61Ø X$=X$+"NEW"+Z$+"P{SHFT O}55,"+STR$(PEEK
    (55))+":P{SHFT O}56,"+STR$(PEEK(56))
                                          :REM*22
62Ø X$=X$+":P{SHFT O}77Ø,"+STR$(PEEK(55))+"
    :P{SHFT O}771,"+STR$(PEEK(56))+Z$:REM*8
63Ø FORI=1TOLEN(X$):V=ASC(MID$(X$,I)):POKE8
    74+I,V:PRINTCHR$(V-(V=Ø)*13);:NEXTI
                                          :REM*2
64Ø PRINT:PRINT"SAVING "W$                :REM*15Ø
65Ø CLOSE5:CLOSE15:OPEN15,8,15,"I":OPEN5,8,
    5,"Ø:"+W$+",P,W"                      :REM*154
66Ø GOSUB73Ø:IFER<>ØTHENCLOSE5:CLOSE15:GOTO
    54Ø                                   :REM*1Ø8
67Ø PRINT#5,CHR$(2)CHR$(3)CHR$(6Ø)CHR$(3);
                                          :REM*58
68Ø FORI=772TO1Ø19:PRINT#5,CHR$(PEEK(I));:N
    EXTI                                  :REM*224
69Ø CLOSE5:CLOSE15:PRINT"{CTRL 9}DONE"
                                          :REM*138
7ØØ PRINT"TO INSTALL WEDGE"               :REM*156
71Ø PRINT"LOAD"CHR$(34)W$CHR$(34)",8,1"
                                          :REM*56
72Ø END                                   :REM*212
73Ø INPUT#15,ER,E1$,TT,SS:IFER=ØTHENRETURN
                                          :REM*72
74Ø PRINTE1$;TT;SS:RETURN                 :REM*46
75Ø REM DATA BLOCK 1                      :REM*198
76Ø DATA172,1Ø6,3,185,1Ø7,3,2Ø8,13,169,131
                                          :REM*188
77Ø DATA141,2,3,169,196,141,3,3,1Ø8,2
                                          :REM*23
78Ø DATA3,162,Ø,185,1Ø7,3,157,Ø,2,24Ø
                                          :REM*145
79Ø DATA4,232,2ØØ,2Ø8,244,2ØØ,14Ø,1Ø6,3,162
                                          :REM*77
8ØØ DATA255,16Ø,1,76,134,196,Ø,Ø          :REM*111
81Ø REM DATA BLOCK 2                      :REM*19
82Ø DATA173,1Ø4,96,24Ø,3,32,76,96,32,96,197
    ,16Ø,Ø,162,Ø,189                      :REM*125
83Ø DATAØ,2,217,129,96,2Ø8,8,9,Ø,24Ø,31,232
    ,2ØØ,2Ø8,24Ø,185                      :REM*199
84Ø DATA129,96,24Ø,3,2ØØ,2Ø8,248,2ØØ,185,12
    9,96,2Ø8,25Ø,2ØØ,185,129              :REM*195
85Ø DATA96,2Ø8,218,162,255,16Ø,1,76,134,196
    ,162,255,2ØØ,232,185,129              :REM*193
86Ø DATA96,157,Ø,2,2Ø8,246,32,76,96,24,144,
    231,162,23,189,1Ø5                    :REM*157
```

→

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```
870 DATA96,168,189,43,0,157,105,96,152,157,
    43,0,202,16,239,173                    :REM*111
880 DATA104,96,73,255,141,104,96,96,0,1,98,
    137,98,137,98,137                      :REM*35
890 DATA98,0,128,0,0,0,128,0,0,0,0,0,0,0,0,0,
    0                                      :REM*165
900 REM DATA BLOCK 3                       :REM*125
910 DATA0,104,5,76,18,129,31,129,40,129,46,
    129                                    :REM*117
920 DATA62,129,70,76,78,105,85,105,95,104,1
    00,104                                 :REM*221
```

Listing 2. *Sample wedge utilities.*

```
10 REM SAMPLE UTILITY PROGRAMS             :REM*206
20 REM ERR-READ DISK ERROR CHANNEL         :REM*86
30 CLOSE100:OPEN100,8,15                   :REM*54
40 INPUT#100,N,ER$,T,S                     :REM*38
50 PRINTN;ER$;T;S:CLOSE100:END             :REM*56
60 REM HEX-CONVERT A NUMBER FROM DECIMAL TO
    HEXADECIMAL                            :REM*36
70 PRINT"CONVERT TO HEX"                   :REM*180
80 D=0:INPUT"DECIMAL";D:IFD=0THENEND       :REM*2
90 H$="":D=D/4096:FORI=1TO4:T%=D:H$=H$+CHR$
   (48+T%-(T%>9)*7)                        :REM*10
100 D=16*(D-T%):NEXT:PRINT"HEX "H$:GOTO80
                                           :REM*186
110 REM DEC-CONVERT FROM HEXADECIMAL TO DEC
    IMAL                                   :REM*64
120 PRINT"CONVERT TO DECIMAL"              :REM*232
130 H$="":INPUT"HEX";H$:IFH$=""THENEND
                                           :REM*146
140 D=0:FORI=1TO4:T%=ASC(H$):T%=T%-48+(T%>6
    4)*7                                   :REM*24
150 H$=MID$(H$,2):D=16*D+T%:NEXT:PRINT"DECI
    MAL"D:GOTO130                          :REM*122
160 REM INIT-INITIALIZE DISK DRIVE         :REM*44
170 CLOSE100:OPEN100,8,15,"I":INPUT#100,N,E
    R$,T,S                                 :REM*222
180 IFN<>0THEN50                           :REM*60
190 PRINT"DRIVE INITIALIZED":END           :REM*56
200 REM SCRATCH-DELETE A FILE FROM DISK
                                           :REM*214
210 F$="":INPUT"FILE";F$:IFF$=""THENEND
                                           :REM*208
220 PRINT"SCRATCH "F$:INPUT"SURE (Y/N)";R$:
    IFR$<>"Y"THENEND                       :REM*38
230 CLOSE100:OPEN100,8,15,"S0:"+F$:GOTO40
                                           :REM*88
240 REM RENAME-RENAME A FILE               :REM*148
250 F1$="":INPUT"OLD NAME";F1$:IFF1$=""THEN
    END                                    :REM*68
260 F2$="":INPUT"NEW NAME";F2$:IFF2$=""THEN
    END                                    :REM*137
270 CLOSE100:OPEN100,8,15,"R0:"+F2$+"="+F1$
    :GOTO40                                :REM*45
280 REM HEADER-FORMAT A NEW DISK           :REM*233
290 F1$="":INPUT"DISK NAME";F1$:IFF1$=""ORL
    EN(F1$)>16THEN290                      :REM*123
300 F2$="":INPUT"2 CHAR ID";F2$:IFLEN(F2$)<
    >2THEN300                              :REM*81
310 PRINT"THIS WILL ERASE DISK":INPUT"GO AH
    EAD (Y/N)";R$:IFR$<>"Y"THENEND         :REM*81
320 CLOSE100:OPEN100,8,15,"N0:"+F1$+","+F2$
    :CLOSE100:GOTO20                       :REM*159
330 REM DIR-PRINT DISK DIRECTORY             :REM*5
340 Z$=CHR$(0):CLOSE100:CLOSE101:OPEN100,8,
    15:OPEN101,8,0,"$0"                    :REM*13
350 INPUT#100,N,ER$,T,S:IFN<>0THEN50:REM*93
360 GET#101,A$:IFA$<>"{CTRL 9}"THEN360
                                           :REM*193
370 PRINTA$;:GOTO460                       :REM*63
380 GETC$:IFC$=""THEN420                   :REM*243
390 IFC$<>" "THEN510                       :REM*203
400 GETC$:IFC$=""THEN400                   :REM*135
410 IFC$<>" "THEN510                       :REM*223
420 GET#101,A$:S=ST:A=ASC(A$+Z$)           :REM*131
430 GET#101,B$:S=ST:B=ASC(B$+Z$)           :REM*157
440 IFSTHEN510                               :REM*5
450 IFA=1ANDB=1THENGOSUB480                :REM*209
460 GET#101,A$:IFA$=""THENPRINT:GOTO380
                                           :REM*219
470 PRINTA$;:GOTO460                       :REM*163
480 GET#101,A$:S=ST:A=ASC(A$+Z$)           :REM*191
490 GET#101,B$:S=ST:B=ASC(B$+Z$)           :REM*217
500 N=B*256+A:PRINTN;:RETURN               :REM*231
510 CLOSE101:CLOSE100                      :REM*101
520 END                                      :REM*12
530 REM HELP-PRINT DOCUMENTATION           :REM*120
540 PRINT:PRINT"COMMANDS AVAILABLE ARE:"
                                           :REM*210
550 PRINT"ERR{5 SPACEs}-READ ERROR CHANNEL"
                                           :REM*176
560 PRINT"HEX{5 SPACEs}-CONVERT NUMBER TO H
    EX"                                    :REM*154
570 PRINT"DEC{5 SPACEs}-CONVERT NUMBER TO D
    ECIMAL"                                :REM*32
580 PRINT"INIT{4 SPACEs}-INITIALIZE DISK DR
    IVE"                                   :REM*230
590 PRINT"SCRATCH -DELETE DISK FILE":REM*36
600 PRINT"RENAME{2 SPACEs}-RENAME A DISK FI
    LE"                                    :REM*164
610 PRINT"HEADER{2 SPACEs}-FORMAT A NEW DIS
    K"                                     :REM*12
620 PRINT"DIR{5 SPACEs}-PRINT THE DISK DIRE
    CTORY"                                 :REM*182
630 PRINT"HELP{4 SPACEs}-PRINT THIS HELP ME
    SSAGE"                                 :REM*102
640 END                                    :REM*132
```

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Block Busters

With a paddle and a ball, the object of this game is to "bust" as many blocks as possible without letting the ball slip past you.

By MICHAEL LONGTIN

Block Busters is a one-player game that uses color, sound and the fast action of machine language. The secret is to keep your eye on the ball—not on how many blocks it breaks.

There are 255 skill levels from which to choose. Level 255 is extraordinarily slow, and level 1 is impossibly fast. The best level for a beginner is probably 35.

The game begins with 95 blocks at the top of the screen. You have five balls. Move the paddle left and right with the joystick, which you must plug into port 2. Try to keep the paddle under the ball as much as possible.

When you clear the screen, you move to the next fastest level and a full new screen. When you lose five balls, your final score is displayed—you receive one point for each block you bust—and you are asked if you want to play again.

A Pause Feature

Have you ever wanted a pause feature in your program, to prevent you from having to keep checking for input? Well, here's your answer, a short machine language subroutine that checks the keyboard. If the shift-lock key is pressed in the down position, program execution halts until the shift-lock key is in the up position. You need only type in the following short program and run it. This program Pokes the machine language Pause routine into memory.

```
10 INPUT "STARTING
   ADDRESS";A:IN = A + 13
20 FOR I = 0 TO 25:READ N:POKE
   I + A,N:NEXT I
30 POKE A + 7,IN/256:POKE
   A + 2,IN - INT(IN/256)*256
40 PRINT "TO ACTIVATE, TYPE
   'SYS';A;" '"
50 DATA 120,169,0,141,20,3,
   169,0,141,21,3,88,96
60 DATA 32,159,255,173,141,2,201,
   1,240,246,76,49,234
```

This routine is completely relocatable, which means it can be put anywhere in memory. When the program asks for the starting address, enter the address of the memory location where you want the Pause routine to be stored. A good place for it is in the machine language buffer at 49152.

When the program ends, it tells you how to activate the Pause routine. Put these instructions at the beginning of your program. Do not activate it when you're in Edit mode; it won't work then, because when you press the shift key (to move the cursor or clear the screen), the cursor stops. To deactivate the Pause routine, type SYS 8 or press the run/stop and restore keys.

For those interested, here is a listing of the machine code Pause routine in assembler syntax:

```
1000 START SEI ;DISABLE ALL
     INTERRUPTS
1010 LDA #<PROG ;CHANGE
1020 STA 788 ;INTERRUPT
1030 LDA #>PROG ;VECTOR
1040 STA 789
1050 CLI ;ENABLE ALL INTERRUPTS
1060 RTS ;RETURN TO BASIC
1070 PROG JSR SCNKEY ;SCAN
     KEYBOARD
1080 LDA $028D ;SHIFT FLAG
1090 CMP #$01 ;SHIFT PRESSED?
1100 BEQ PROG;NO - CHECK AGAIN
1110 JMP $EA31 ;YES - JUMP TO
     NORMAL INTERRUPT ROUTINE
```

RUN It Right

C-64; C-128 (in C-64 mode); joystick

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As you can see, this routine is interrupt-driven. It is executed every 1/60th of a second along with the regular Interrupt routine, which updates the software clock, handles the cursor flash, reads the keyboard and keeps the cassette motor on if the play button is pressed.

The first part of the program changes the location of the interrupt routine to point to PROG. PROG scans the keyboard (which updates the shift flag) and checks the shift flag (which will contain a 1 if the shift key is pressed). If the shift key is pressed, the program rechecks. If it is not pressed, then it transfers control to the normal Interrupt routine (at $EA31).

Special Typing Instructions

There are two programs with this article. Listing 1, Blockbuster Loader, Pokes the machine code at 49152 (the machine code buffer). Please note that you can't put your pause program at 49152, but you can put it higher in the machine code buffer, at, say, 51200. After you have typed in the Loader program, run it; then type in the main Blockbuster program and run it. I suggest you save these programs after you've typed them in.

For those of you who don't want to type in the program yourselves, I'll be glad to make you a copy of the program (disk only). Just send me $3, a blank disk and a self-addressed stamped envelope. R

Address all author correspondence to Michael Longtin, RFD 2, Box 2760, Greene, ME 04236.

Listing 1. *Blockbuster Loader program.*

```
5 PRINT"{SHFT CLR}PLEASE WAIT WHILE I POKE
  IN MY DATA..."                          :REM*165
1Ø I=49152                                :REM*74
2Ø READ A:IF A=256 THEN END               :REM*182
3Ø POKE I,A:I=I+1:GOTO 2Ø                 :REM*212
49152 DATA 169,16Ø,162,Ø,157,192,7,232
                                          :REM*232
4916Ø DATA 224,4Ø,2Ø8,248,96,169,4,141
                                          :REM*42
49168 DATA 6,192,169,Ø,141,5,192,32       :REM*22
49176 DATA Ø,192,169,7,141,6,192,169
                                          :REM*172
49184 DATA 192,141,5,192,32,Ø,192,76
                                          :REM*124
49192 DATA 67,192,32,176,195,169,65,141
                                          :REM*38
492ØØ DATA 4,212,162,16,16Ø,Ø,136,2Ø8
                                          :REM*3Ø
492Ø8 DATA 253,2Ø2,2Ø8,248,169,64,141,4
                                          :REM*172
49216 DATA 212,96,234,16Ø,Ø,169,16Ø,153
                                          :REM*242
49224 DATA Ø,4,153,39,4,153,24Ø,4         :REM*114
49232 DATA 153,23,5,153,224,5,153,7       :REM*214
4924Ø DATA 6,153,2Ø8,6,153,247,6,24       :REM*118
49248 DATA 152,1Ø5,4Ø,168,192,24Ø,2Ø8,221
                                          :REM*246
49256 DATA 169,1Ø2,16Ø,Ø,162,Ø,157,41
                                          :REM*186
49264 DATA 4,157,81,4,157,121,4,157       :REM*64
49272 DATA 161,4,157,2Ø1,4,232,224,38
                                          :REM*38
4928Ø DATA 2Ø8,236,169,17Ø,133,251,169,7
                                          :REM*18Ø
49288 DATA 133,252,96,32,229,192,32,239
                                          :REM*138
49296 DATA 192,173,Ø,22Ø,234,2Ø1,123,24Ø
                                          :REM*17Ø
493Ø4 DATA 1Ø,2Ø1,119,24Ø,21,32,229,192
                                          :REM*254
49312 DATA 96,2Ø8,25Ø,198,251,16Ø,Ø,177
                                          :REM*176
4932Ø DATA 251,2Ø1,32,24Ø,16,23Ø,251,76
                                          :REM*226
49328 DATA 157,192,16Ø,7,177,251,2Ø1,32
                                          :REM*112
49336 DATA 24Ø,25,76,157,192,23Ø,251,16Ø
                                          :REM*226
49344 DATA 6,169,32,145,251,165,251,2Ø8
                                          :REM*6
49352 DATA 2,198,252,198,251,32,229,192
                                          :REM*3Ø
4936Ø DATA 76,157,192,16Ø,Ø,169,32,145
                                          :REM*252
49368 DATA 251,23Ø,251,2Ø8,2,23Ø,252,32
                                          :REM*198
49376 DATA 229,192,76,157,192,16Ø,5,169
                                          :REM*3Ø
49384 DATA 12Ø,145,251,136,2Ø8,251,96,162
                                          :REM*182
49392 DATA 7Ø,16Ø,Ø,136,2Ø8,253,2Ø2,2Ø8
                                          :REM*166
494ØØ DATA 248,96,234,234,96,169,1,141
                                          :REM*146
494Ø8 DATA Ø,196,141,1,196,169,16,141
                                          :REM*47
49416 DATA 2,196,141,3,196,173,2,196
                                          :REM*115
49424 DATA 141,4,196,173,3,196,141,5      :REM*39
49432 DATA 196,173,Ø,196,2Ø1,1,24Ø,3      :REM*87
4944Ø DATA 76,47,193,173,2,196,56,233
                                          :REM*135
49448 DATA 1,141,2,196,76,56,193,173
                                          :REM*195
49456 DATA 2,196,24,1Ø5,1,141,2,196       :REM*2Ø3
49464 DATA 173,1,196,2Ø1,1,24Ø,3,76       :REM*17
49472 DATA 78,193,173,3,196,24,1Ø5,1      :REM*97
4948Ø DATA 141,3,196,76,87,193,173,3
                                          :REM*135
49488 DATA 196,56,233,1,141,3,196,169
                                          :REM*175
49496 DATA 4,141,255,195,169,Ø,141,254
                                          :REM*131
495Ø4 DATA 195,141,12,196,173,2,196,141
                                          :REM*37
49512 DATA 13,196,16Ø,5,173,13,196,1Ø
                                          :REM*37
4952Ø DATA 141,13,196,173,12,196,42,141
                                          :REM*155
49528 DATA 12,196,136,192,Ø,2Ø8,237,24
                                          :REM*155
49536 DATA 173,254,195,1Ø9,13,196,141,254
                                          :REM*245
49544 DATA 195,173,255,195,1Ø9,12,196,141
                                          :REM*133
49552 DATA 255,195,173,2,196,141,13,196
                                          :REM*165
4956Ø DATA 169,Ø,141,12,196,16Ø,3,173
                                          :REM*43
49568 DATA 13,196,1Ø,141,13,196,173,12
                                          :REM*193
49576 DATA 196,42,141,12,196,136,2Ø8,239
                                          :REM*231
49584 DATA 24,173,254,195,1Ø9,13,196,141
                                          :REM*249
49592 DATA 254,195,173,255,195,1Ø9,12,196
                                          :REM*2Ø9
496ØØ DATA 141,255,195,169,4,141,11,196
                                          :REM*1Ø3
496Ø8 DATA 169,Ø,141,1Ø,196,141,12,196
                                          :REM*199
```

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Listing 1 continued.

```
49616 DATA 173,4,196,141,13,196,160,5
                                        :REM*139
49624 DATA 173,13,196,10,141,13,196,173
                                        :REM*109
49632 DATA 12,196,42,141,12,196,136,192
                                        :REM*123
49640 DATA 0,208,237,24,173,10,196,109
                                         :REM*67
49648 DATA 13,196,141,10,196,173,11,196
                                        :REM*207
49656 DATA 109,12,196,141,11,196,173,4
                                        :REM*255
49664 DATA 196,141,13,196,169,0,141,12
                                         :REM*36
49672 DATA 196,160,3,173,13,196,10,141
                                         :REM*98
49680 DATA 13,196,173,12,196,42,141,12
                                         :REM*96
49688 DATA 196,136,208,239,173,10,196,109
                                        :REM*128
49696 DATA 13,196,141,10,196,173,11,196
                                          :REM*0
49704 DATA 109,12,196,141,11,196,24,173
                                        :REM*108
49712 DATA 3,196,109,254,195,141,254,195
                                        :REM*244
49720 DATA 169,0,109,255,195,141,255,195
                                        :REM*210
49728 DATA 24,173,5,196,109,10,196,141
                                        :REM*214
49736 DATA 10,196,169,0,109,11,196,141
                                         :REM*84
49744 DATA 11,196,173,255,195,141,98,194
                                        :REM*244
49752 DATA 173,254,195,141,97,194,169,81
                                         :REM*28
49760 DATA 141,244,6,173,10,196,141,114
                                         :REM*48
49768 DATA 194,173,11,196,141,115,194,169
                                        :REM*212
49776 DATA 32,141,205,6,173,2,196,201
                                        :REM*136
49784 DATA 23,240,3,76,129,194,76,254
                                        :REM*178
49792 DATA 194,173,2,196,201,22,240,3
                                         :REM*62
49800 DATA 76,183,194,24,173,254,195,105
                                         :REM*12
49808 DATA 40,141,14,196,169,0,109,255
                                        :REM*174
49816 DATA 195,141,15,196,173,14,196,141
                                         :REM*64
49824 DATA 169,194,173,15,196,141,170,194
                                        :REM*158
49832 DATA 173,162,7,201,32,240,79,169
                                         :REM*40
49840 DATA 1,141,0,196,32,42,192,173
                                        :REM*158
49848 DATA 2,196,201,1,240,3,76,201:REM*212
49856 DATA 194,169,0,141,0,196,32,42
                                        :REM*242
49864 DATA 192,173,3,196,201,38,240,3
                                        :REM*240
49872 DATA 76,219,194,169,0,141,1,196
                                        :REM*230
49880 DATA 32,42,192,173,3,196,201,1
                                        :REM*128
49888 DATA 240,3,76,237,194,169,1,141
                                        :REM*140
49896 DATA 1,196,32,42,192,169,32,141
                                        :REM*140
49904 DATA 152,7,141,191,7,32,139,192
                                        :REM*250
49912 DATA 76,255,194,76,13,193,96,173
                                        :REM*246
49920 DATA 0,196,201,1,240,5,76,25   :REM*99
49928 DATA 196,208,253,76,55,196,173,1
                                        :REM*113
49936 DATA 196,201,0,240,8,169,39,141
                                        :REM*241
49944 DATA 55,195,76,37,195,169,41,141
                                        :REM*207
49952 DATA 55,195,76,37,195,173,254,195
                                        :REM*147
49960 DATA 141,13,196,173,255,195,141,12
                                         :REM*49
49968 DATA 196,234,24,173,13,196,105,39
                                         :REM*69
49976 DATA 141,13,196,173,12,196,105,0
                                        :REM*129
49984 DATA 141,12,196,173,13,196,141,80
                                        :REM*141
49992 DATA 195,173,12,196,141,81,195,173
                                        :REM*139
50000 DATA 244,6,201,102,240,3,76,13:REM*43
50008 DATA 193,76,102,195,201,0,240,3
                                         :REM*63
50016 DATA 76,102,195,76,13,193,238,22
                                         :REM*51
50024 DATA 196,173,2,196,141,4,196,173
                                        :REM*129
50032 DATA 3,196,141,5,196,32,42,192
                                        :REM*231
50040 DATA 173,1,196,201,0,240,6,160:REM*73
50048 DATA 1,76,135,195,234,160,255,140
                                        :REM*211
50056 DATA 23,196,76,141,195,24,173,3
                                        :REM*129
50064 DATA 196,109,23,196,141,3,196,32
                                         :REM*55
50072 DATA 87,196,76,165,195,141,2,196
                                          :REM*7
50080 DATA 169,0,141,0,196,173,22,196
                                         :REM*91
50088 DATA 201,95,240,3,76,87,193,96:REM*91
50096 DATA 166,2,165,253,133,253,165,254
                                        :REM*191
50104 DATA 133,254,224,0,240,16,169,25
                                        :REM*157
50112 DATA 24,101,253,133,253,169,0,101
                                         :REM*39
50120 DATA 254,133,254,202,208,240,160,0
                                        :REM*233
50128 DATA 177,253,153,0,212,200,192,26
                                         :REM*11
50136 DATA 208,246,96,97,8,192,7,64  :REM*27
50144 DATA 18,48,0,0,0,0,0,0         :REM*215
50152 DATA 0,0,0,0,0,0,0,0            :REM*93
50160 DATA 0,0,0,15,0,0,0,0          :REM*231
50168 DATA 0,251,255,197,64,0,244,6:REM*119
50176 DATA 0,0,18,36,17,37,255,255   :REM*62
50184 DATA 255,255,205,6,0,136,162,7
                                        :REM*168
50192 DATA 255,255,255,255,255,255,17,1
                                        :REM*184
50200 DATA 255,173,1,196,201,0,240,5
                                        :REM*250
50208 DATA 169,41,76,68,196,169,39,76
                                        :REM*130
50216 DATA 68,196,169,24,141,50,195,169
                                        :REM*214
50224 DATA 105,141,54,195,76,37,195,169
                                        :REM*166
50232 DATA 56,141,50,195,169,233,141,54
                                        :REM*176
50240 DATA 195,76,79,196,141,55,195,169
                                        :REM*186
50248 DATA 105,141,62,195,76,42,196,169
                                        :REM*136
50256 DATA 233,141,62,195,76,14,195,173
                                         :REM*68
```

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Listing 1 continued.

```
5Ø264 DATA Ø,196,2Ø1,Ø,24Ø,8,169,255
                                        :REM*236
5Ø272 DATA 141,24,196,76,1Ø7,196,169,1
                                        :REM*172
5Ø28Ø DATA 141,24,196,24,173,2,196,1Ø9
                                        :REM*186
5Ø288 DATA 24,196,141,2,196,173,Ø,196
                                        :REM*234
5Ø296 DATA 2Ø1,Ø,24Ø,8,169,Ø,141,Ø :REM*11Ø
5Ø3Ø4 DATA 196,76,137,196,169,1,141,Ø
                                        :REM*24Ø
5Ø312 DATA 196,96,256                   :REM*74
```

Listing 2. *Blockbuster main program.*

```
1 B=5:S=Ø                               :REM*155
5 POKE253,219:POKE254,195:POKE2,Ø:SYS5ØØ96
                                        :REM*193
1Ø PRINT"{SHFT CLR}{14 CRSR RTs}BLOCK BUST"
                                        :REM*86
2Ø PRINT"{3 CRSR DNs}{1Ø CRSR RTs}INSTRUCTI
   ONS? (Y/N)"                          :REM*2Ø4
3Ø GETA$:IFA$=""THEN3Ø                  :REM*2Ø2
4Ø IFA$<>"Y"ANDA$<>"N"THEN3Ø             :REM*Ø
5Ø IFA$="N"THEN131                      :REM*15Ø
6Ø PRINT"{SHFT CLR}{2 CRSR DNs}THE OBJECT O
   F BLOCK BUST IS TO BUST AS"          :REM*76
7Ø PRINT"{CRSR DN}MANY BLOCKS AS POSSIBLE.
   YOU HAVE TO"                         :REM*212
8Ø PRINT"{CRSR DN}KEEP THE BALL IN MOTION B
   Y MOVING YOUR"                       :REM*34
9Ø PRINT"{CRSR DN}PADDLE UNDERNEATH IT SO I
   T CAN BOUNCE"                        :REM*196
1ØØ PRINT"{CRSR DN}OFF. YOU HAVE 5 BALLS PE
    R GAME."                            :REM*118
1Ø5 PRINT"{CRSR DN}USE JOYSTICK PORT 2."
                                        :REM*15
11Ø PRINT"{2 CRSR DNs}{14 CRSR RTs}{CTRL 9}
   GOOD LUCK!"                          :REM*13Ø
12Ø PRINT"{CRSR DN}{1Ø CRSR RTs}PRESS {CTRL
    9}SPACE{CTRL Ø} TO PLAY"            :REM*214
13Ø POKE198,Ø:WAIT197,32                :REM*248
131 INPUT"{SHFT CLR}{13 CRSR DNs}{8 CRSR RT
   s}SPEED (1-255),1=FASTEST";L         :REM*145
132 POKE49392,L:POKE5Ø198,Ø             :REM*224
14Ø POKE5328Ø,13:POKE53281,Ø:PRINT"{SHFT CL
   R}":POKE53281,1:SYS49165             :REM*142
141 PRINT"{HOME}{CRSR DN}{CRSR RT}{COMD 7}{
   COMD +} {COMD +} {COMD +} {COMD +} {COM
   D +} {COMD +} {COMD +} {COMD +} {COMD +
   } {COMD +} {COMD +} {COMD +} {COMD +} {
   COMD +} {COMD +} {COMD +} {COMD +} {COM
   D +} {COMD +} "                      :REM*15
142 PRINT"{CRSR RT} {COMD +} {COMD +} {COMD
    +} {COMD +} {COMD +} {COMD +} {COMD +}
    {COMD +} {COMD +} {COMD +} {COMD +} {C
   OMD +} {COMD +} {COMD +} {COMD +} {COMD
    +} {COMD +} {COMD +} {COMD +}":REM*2Ø8
143 PRINT"{CRSR RT}{COMD +} {COMD +} {COMD
   +} {COMD +} {COMD +} {COMD +} {COMD +}
   {COMD +} {COMD +} {COMD +} {COMD +} {CO
   MD +} {COMD +} {COMD +} {COMD +} {COMD
   +} {COMD +} {COMD +} {COMD +} " :REM*97
144 PRINT"{CRSR RT} {COMD +} {COMD +} {COMD
    +} {COMD +} {COMD +} {COMD +} {COMD +}
    {COMD +} {COMD +} {COMD +} {COMD +} {C
   OMD +} {COMD +} {COMD +} {COMD +} {COMD
    +} {COMD +} {COMD +} {COMD +}":REM*21Ø
145 PRINT"{CRSR RT}{COMD +} {COMD +} {COMD
   +} {COMD +} {COMD +} {COMD +} {COMD +}
   {COMD +} {COMD +} {COMD +} {COMD +} {CO
   MD +} {COMD +} {COMD +} {COMD +} {COMD
   +} {COMD +} {COMD +} {COMD +} " :REM*99
146 POKE5Ø179,22:POKE5Ø178,12           :REM*34
147 POKE5Ø176,1:POKE5Ø177,1             :REM*119
148 FORA=56216TO56254:POKEA,1Ø:NEXT:REM*198
15Ø SYS49421                            :REM*24Ø
151 IFPEEK(5Ø198)=95THEN1ØØØ            :REM*151
16Ø POKE1Ø24+PEEK(5Ø178)*4Ø+PEEK(5Ø179),32
                                        :REM*126
164 B=B-1:IFB=ØTHEN19Ø                  :REM*17Ø
165 PRINT"{CTRL 1}{HOME}{8 CRSR DNs}{7 CRSR
    RTs}PRESS {CTRL 9}SPACE{CTRL Ø} FOR NE
   XT BALL"                             :REM*223
166 POKE198,Ø                            :REM*78
167 GETA$:IFA$<>" "THEN167               :REM*19
168 PRINT"{CRSR UP}{CRSR RT}{33 SPACEs}"
                                        :REM*248
18Ø GOTO146                             :REM*11Ø
19Ø POKE1Ø24+PEEK(5Ø178)*4Ø+PEEK(5Ø179),32
                                        :REM*156
2ØØ S=S+PEEK(5Ø198)                     :REM*2Ø2
2Ø5 PRINT"{SHFT CLR}{11 CRSR DNs}{14 CRSR R
   Ts}SCORE:"S                          :REM*117
21Ø PRINT"{CRSR DN}{1Ø CRSR RTs}PLAY AGAIN?
    (Y/N)"                              :REM*234
22Ø GETA$:IFA$=""THEN22Ø                 :REM*Ø
23Ø IFA$<>"Y"ANDA$<>"N"THEN22Ø          :REM*22Ø
24Ø IFA$="N"THENPRINT"{SHFT CLR}":END
                                        :REM*166
25Ø RUN                                  :REM*36
1ØØØ PRINT"{SHFT CLR}{7 CRSR DNs}{12 CRSR R
    Ts}YOU WON AT SPEED"L               :REM*11
1ØØ5 S=S+PEEK(5Ø198)                    :REM*242
1Ø1Ø PRINT"{2 CRSR DNs}{CRSR RT}PRESS {CTRL
    9}SPACE{CTRL Ø} FOR NEXT SPEED: SPEED
    "L-1                                :REM*151
1Ø2Ø POKE198,Ø:WAIT197,32:L=L-1:GOTO132
                                        :REM*5
```


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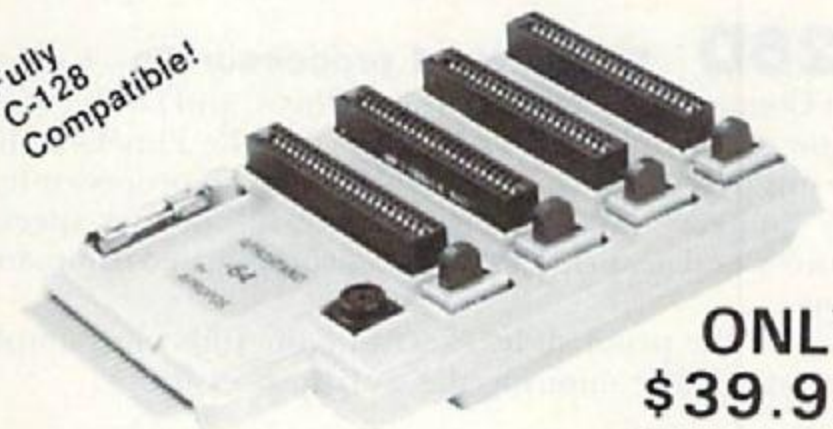

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From p. 11.

```
4Ø V$="{SHFT CLR}{6 CRSR DNs}":W$=CHR$(141
   +CHR$(27)+"T"+CHR$(19):X$="RESET"
9Ø PRINT"THEN TYPE X <RETURN>":PRINT

2 REM VIC-2Ø CHANGES
4Ø POKE937,PEEK(244)-1:POKE942,191
5Ø PRINT"{SHFT CLR}{12 CRSR DNs}"
6Ø PRINT"POKE923,N SHOWS PAGE N"
7Ø PRINT"STOP/RESTORE KILLS"
8Ø PRINT"{CRSR DN}SYS9ØØ REACTIVATES"
9Ø SYS9ØØ:END
```

Louis F. Sander
Pittsburgh, PA

$26C New life for the VIC—Here's a good way to use some of your VIC cartridges on your C-64, in a manner of speaking. The VIC-20 Programmer's Aid cartridge has some excellent utilities on it, the Renumber utility being one of the most useful. After writing a Basic program on the C-64, save it to disk or tape as you usually do. Now load the program into the VIC. (You may need extra memory if the program is a long one.) Next, activate the Programmer's Aid cartridge. You can use all its features, as long as you don't run the C-64 program on the VIC. When your editing is finished, resave the program and move it back to your C-64.

Try this trick with VICMON, too.

Murray Stockill
Seattle, WA

$26D Plus/4 word processor tip—I use a non-Commodore printer with my Plus/4, and I often want to use one of its special typefaces with the Plus/4's built-in word processor. Unfortunately, the word processor has only limited built-in means of accessing printer special features, and my printer requires a complicated command string.

I solve the problem by executing the following simple program before entering the word processor.

```
10 OPEN 4,4 : CMD4
20 PRINT (Printer's code for accessing special typeface)
30 PRINT#4 : CLOSE4
```

The printer does not reset when the computer enters the word processor, so when I print out my document, it comes out in the typeface I selected above.

Chris Edgeworth
Jasper, TX

$26E Making connections—There are many sockets on the rear panel of any Commodore computer, and if you move your machine very often, you must continually match the cables with the proper sockets, while everything is out of sight behind the machine. The video and serial bus DIN connectors are very similar in appearance, which makes it difficult to distinguish between them.

I've used tape and a felt-tip marker to put connector identification labels on the top surface of my machine, just above the back panel. Now I can see where the cables belong, by just looking at the labels. With that information at hand, I can connect my cables by feel, without looking at the back panel, and with no fear of making a shocking mistake.

Kay Belle Joyner
Fitz, IN

$26F Disaster prevention—If you're charged with static electricity and touch one of the joystick ports, you can destroy an important chip inside. Since your video screen is powerfully charged with static, there's a disaster just waiting to happen.

If you put a piece of black electrical tape over the joystick ports, you will insulate them against all but the strongest static charges. The tape is undetectable, won't gum up the ports and can easily be removed when you need to plug in a joystick. It's an excellent safeguard for your computer and your wallet, and I had to learn it the hard way.

Kenny Sumrall
Sumrall, MS

$270 Screen layout aid—When I design a hi-res screen, I take an overhead projector transparency pen and draw on my video monitor a picture of how I want the screen to look. Then I take my graphics program and plot dots underneath my pen lines. If I make a mistake or want to change something, I simply take a wet tissue and wipe off the lines on the screen. If you adopt this method of layout, be sure you use transparency pens, not permanent markers. A popular transparency pen is made by Vis-a-Vis and can be found in most bookstores.

Scott Eldridge
Lima, OH

$271 Diskette handling tip—Everyone knows it's a bad idea to touch the surface of a floppy disk or to allow it to become contaminated in any way. But not everyone realizes that the *bottom* of the disk is the side that's actually written on.

So, if you spill coffee on a disk, you might not have any problems. But if you lay it on a wet or dirty desktop, you may be asking for trouble.

L.F.S.

$272 Disk holder—Office supply stores sell an inexpensive item that is perfect for temporary working storage of computer disks and cartridges. Designed for sorting envelopes or holding telephone messages, it has a plastic base with eight vertical separators, dividing it into seven open-ended compartments. The one I use is

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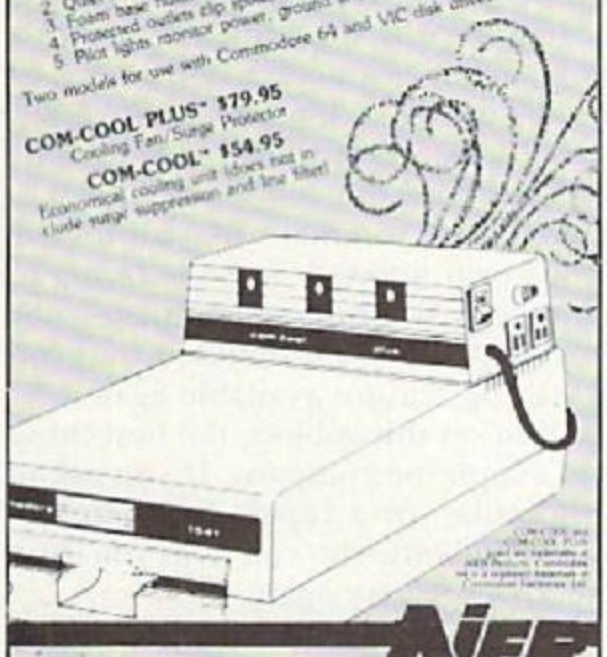

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a Mighty Sorter, made by W.T. Rogers Company, and it fits very nicely on top of my disk drive.

Using this sorter, I can keep about ten disks and cartridges organized on top of my desk, with no immediate need to return them to their envelopes or storage boxes. It really comes in handy when I'm copying disks or otherwise swapping them in and out of the drive.

Margot Poloka
Sewickley, PA

$273 Space saver—Unless you have a custom computer desk, it's always a problem finding room for your printer paper. I keep my paper in a cardboard tray made from the top of the carton it came in, but there's not much room for it between my printer and the wall. Also, no matter where I put my paper, it tends to tear on the cables at the rear of the printer.

My solution is to prop the tray against the wall at a 45–75 degree angle. This lets me move the printer closer to the wall and out of my way on the desk. I put a large empty can or cardboard tube between the printer and the tray, and the paper never touches the cables.

Barry L. Cohen
New York, NY

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$274 More on call-waiting—Call-waiting is a telephone feature that can cut you off if another call comes in while you are on-line with your modem. There's usually some way of temporarily disabling the feature, such as by using call-forwarding to automatically intercept incoming calls. But call-waiting is implemented differently by different telephone companies, and no one method will work in all parts of the country.

Here in southern Wisconsin, you dial *70, wait for the dial tone, then dial your own number. Anyone trying to call you then gets a busy signal until you complete your call. As soon as you hang up, the *70 is disabled, and you have the normal call-waiting feature available again.

If you need information on this subject, the best thing to do is call your local telephone company. If you ask to speak to a switching foreman or a repair foreman, the chances are you'll find somebody who can help you. But, if at first you don't succeed, try, try again.

Walt Grosch, KZ9F
Milwaukee, WI

$275 School days—Have you tried to teach your parents how to use the computer, only to have them walk away furious? Well, here are some of the do's and don'ts of teaching them.

Don't tell them they're dumb or slow or how fast you learned to use the computer.

Don't expect them to remember long commands. Give them one command at a time.

Don't hog the controls, trying to show off. They know you can use the computer or they wouldn't be there.

Do show them applications they're interested in, like word processing.

Do keep them going if they seem interested in a specific program or concept.

Do be patient with them. You weren't a computer whiz in ten minutes, either.

Use your knowledge wisely.

Nick Luggerio
Kingwood, TX

$276 Easy Script tip—Since this program uses the left-arrow key for cursor control, it's not readily apparent what to do if you want to put a left-arrow character in your text. Control 7 will do the job.

Michael A. Packer
Washington, WV

$277 Fast Load re-enable—Documentation for the popular Epyx Fast Load cartridge says that once it is disabled, the only way to re-enable the cartridge is to reset the computer. I've found a second way to re-enable it. Just enter SYS 57194.

Bryan K. Davidson
Clovis, NM

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Software Gallery

From p. 18.

fect. The winner in each category will receive a prize of more than $1000, as well as a computer for use in the classroom. All *entrants will receive a prize. Winners' books will be published and distributed by Woodbury and Grolier. The contest will run from October 15, 1985 until January 15, 1986.*

Skyfox

B

This Combat Flight Simulator is Pure And Simple Fun

Although Skyfox may not be the most realistic aerial combat game available, it's definitely one of the most exciting. Not only can Skyfox accelerate to 3000 mph before you can say "thermonuclear device," but the plane is equipped with everything a federation pilot needs to defend his home asteroid base against enemy invasion.

The cockpit instrumentation features digital readouts displaying total elasped time since the beginning of a mission, speed in miles-per-hour, altitude, compass heading, your current coordinates according to the base computer's tactical map, and the number of remaining guided and heat-seeking missiles in the hold. Graphic indicators let you monitor your fuel consumption and shield strength, as well as the status of the plane's automatic pilot. Finally, a radar scanner provides either an overhead or forward view of the area you're patrolling.

Once you've become familiar with the instrumentation and weapons systems, you have a choice of fifteen different scenarios. When Skyfox is launched, you can select either a high- or low-altitude course, depending on whether you want to first involve the enemy jets in aerial combat, or, instead, fly a strafing mission against oncoming tanks and hovering ships.

For all of Skyfox's advanced features, however, it's not a particularly difficult fighter to fly. For instance, no matter how you jostle your joystick, the plane seems to remain perfectly level while climbing, diving or turning. Therefore, maneuvers such as rolls and loops are out of the question. In fact, on the easiest level (there are five in all), you can hit ground repeatedly without even diminishing your shield strength.

What Skyfox lacks in realism, however, it makes up for with colorful, detailed graphics animation and exciting sound effects. Enemy planes and tanks are fully drawn as solid images rather than simple outlines. Motherships hover like floating cities over the asteroid landscape, and explosions look and sound remarkably true-to-life.

It should be understood that Skyfox doesn't pretend to be a realistic simulation of anything. It's simply a fast-paced, arcade-style game that puts you in the cockpit of a powerful flying machine. If you enjoy blasting your way through enemy-filled skies without worrying about your jet disintegrating at maximum speed, then Skyfox is your kind of plane. *(Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403. C-64/$34.95 disk.)*

Bob Guerra
Charlestown, MA

Paperback Writer 64

A

Here's a High Quality Word Processor for Your Commodore 64

First-rate word processing software for the Commodore 64 has continued to become more readily available at lower prices. The recent release of Paperback Writer 64 would seem to be the best evidence of just how far this software has come. (Although the list price is $100, the program is available from several distributors for approximately $40.)

This program is not only among the best of the word processors available for the C-64, it's one of the best that I've seen running on any microcomputer. It gives the previous heavyweights of word processing some true competition.

Paperback Writer 64 offers features that are truly remarkable, given the constraints of 40-column hard-

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ware and 64K memory. Such features include all of the usual editing operations, complete on-screen formatting, true word wrap in the editing mode, mail merge, global file capabilities, complete support of disk operations and a spelling checker.

The program's only real limitations are a small (7K) text buffer (an unavoidable tradeoff when attempting to pack this much power into the C-64's memory space), and a somewhat slow screen speed when operating in the 80-column mode. This second drawback is a result of the program's use of bit-mapped characters, which allows the software to overcome the C-64's 40-column limitations. I sometimes found this slowness irritating.

The basic setup of Paperback Writer 64 is somewhat different from that of several top-of-the-line text processors for the C-64 in that it is not a post-formatted system. This means that text is formatted on screen, rather than during the printing out of a document, through the use of formatting commands embedded in the text. What you see on the screen is exactly what will appear when the document is printed out.

The program's formatting and character codes are completely compatible with those of PaperClip 64, Word Pro +3 and Fleet System, so you can load files from those systems directly into Paperback Writer, without altering anything, and the screen formatting will be exactly the same.

There are useful help screens available, and more detailed explanations of functions are available as help files loaded in from the master disk. The manual is clear and concise, and the key sequences for both cursor control and text manipulation are logical and mnemonic, making them easy to learn and remember. At the time of this writing, a dictionary disk for the spelling checker was forthcoming; I had to create my own disk, entry by entry, which was a slight annoyance.

I wish there were more custom printer files on the master disk. My printer (an Okidata 92) was not supported by the existing files, so I had to create my own file. I also would like to see the copy-protection scheme changed, as it cannot be read by the DOS if you have 1541 Flash! installed. The copy-protection also may not be read properly if you have a non-Commodore disk drive.

These are all minor criticisms of what is clearly a first-rate piece of work. Although it may be impossible to say which of a number of very good word processors for the C-64 is the best, this one certainly ranks among them. Anyone owning a C-64 and looking for very sophisticated word processing should give Paperback Writer 64 serious consideration. *(Digital Solutions, PO Box 345, Station A, Willowdale, Ontario, Canada M2N 5S9. C-64/$100 disk.)*

Douglas Watt
Natick, MA

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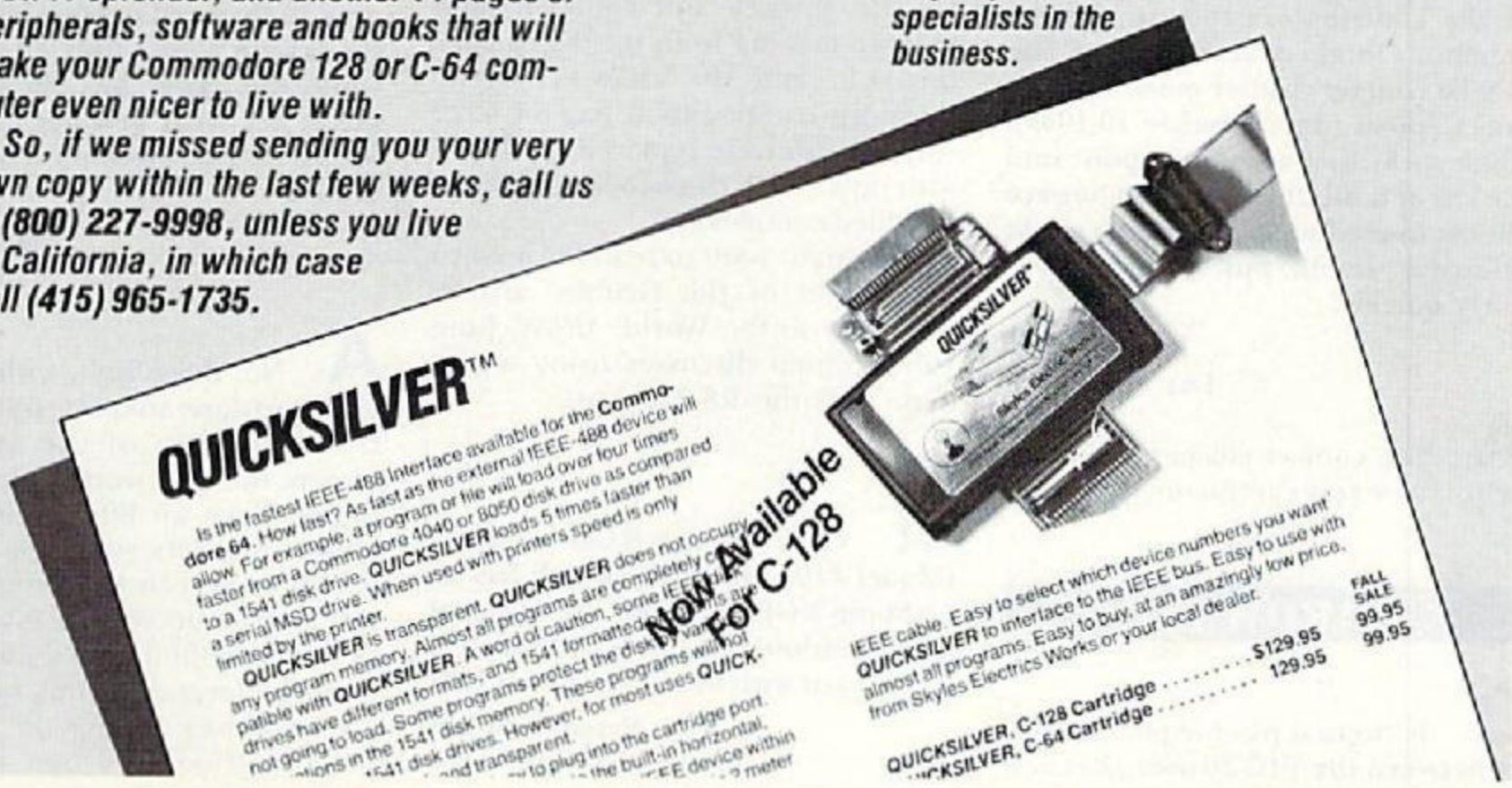

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By JIM STRASMA

Do you have a problem or question about your Commodore computer? Commodore Clinic can help. Just send your question (limit one per entry) on a postcard to:

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Queries are answered only through this column, but, due to the volume of mail, only those questions that appeal to the majority of our readers will be published. Please do not enclose a self-addressed stamped envelope, since we cannot provide personal responses nor answer questions before publication.

UPDATE

Update: I have the solution to the "key bounce" problem posed by one of the contributors to your August column. Obtain a small can of DE-OX-ID contact cleaner made by General Cement (part number 10-1906). Then spray just a small amount into the key at fault. It will stop all bounce almost immediately. There is a slight offensive smell, but it goes away fairly quickly.

Roy Holland
Las Vegas, NV

A: Yes, contact cleaner will often help, but be very careful not to overdo.

HARDWARE

Q: **Is there a pin-for-pin similarity between the VIC-20 user port and the same outlet on the Commodore 64? I am trying to use my ham radio RTTY equipment on a newly acquired 64, but cannot find any information on the chips used in the VIC vs. the 64 or about their connections. The diagram in the *VIC-20 Programmer's Reference Guide* doesn't help.**

Al Michelis
Plymouth, MI

A: The user ports on the VIC and 64 are similar enough that both can use the same modems and RS-232 cartridges, for example, but the ports are not identical. Raeto West covers this point nicely in his new book, *Programming the Commodore 64*. He says that the 64 user port has CIA counter lines, unlike the VIC, and that the VIC port has cassette, joystick and light-pen lines that are missing from the 64. In part, this is because the VIC's I/O operations are handled by a pair of 6522 chips, which were replaced on the 64 with faster 6526 chips to keep up with its added complexity.

You might want to read the second installment of Jim Grubbs' article, "Gateway to the World" (*RUN*, June 1984), which discusses using a modem with the RS-232 port.

Q: **Can a Sears RGB monitor (Model #195-21353452), which has an eight-pin RGB input jack (input signal configuration matches IBM PC or PC jr), be used with the Commodore 128?**

Peter C. Shinn
Rowland Heights, CA

A: Yes, the two should be compatible. I've tested the Sears monitor with good results. It has the further advantage of including a regular TV tuner for watching regular broadcasts. Since the video resolution of the one I tested didn't quite match that of Commodore's 1902 monitor, you should double-check the display you buy for sharpness and clarity. (Any monitor not specifically built for your computer may need adjusting to work properly with it. The last time I bought a monitor, it took two service calls under warranty to get a well-focused, properly centered image.)

Q: **As a novice shopping for my first computer, I was advised to avoid the Commodore 64 computer if planning to do word processing, because the screen shows only 40 characters while the paper has 80. (What you see is *not* what you get.) Is there a way to have an 80-column screen with the 64?**

Estes Gregory
McCall, ID

A: No, there isn't, without a special hardware adapter. But, to offset the limitation of the 40-column screen, the best word processors for the 64 have an 80-column preview option that lets you view your document on screen almost exactly as it will appear on your printout. You'll find this method works quite well for even the largest documents, making Commodores among the most reasonably priced and best small com-

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puters for word processing despite the 40-column limitation.

Although good 80-column hardware adapters are also available for the 64 and are compatible with some of the best word processing programs, if you really want 80 columns all the time, you will be happier with the Commodore 128 and an 80-column monitor. You will find that excellent new versions of popular word processors are already available for it, taking full advantage of its added screen width and text memory. Beyond that, Commodore's new Amiga can, via an emulator, run most word processors written for the IBM PC, some of which are, to date, slightly more advanced than word processing programs available for the C-64.

Q: I own a VIC-20. In your January 1985 column, I read about the 65C02 and W65SC802 chips for upgrading the VIC. Your answer was informative but said nothing about where I could find them or about how much one would cost. If you could supply me with this information, I would be grateful.

Also, I'm kind of confused about the compatibility of the W65SC802 with the IBM computer—will I be able to use IBM software with my VIC? Is this the same as a CP/M cartridge for the VIC?

Travis Seymour
College Park, GA

A: 65C02 chips should be available through any Apple dealer now, as they are used in the Apple IIc computer. I have not seen the W65SC802 listed in chip catalogs yet, but you or your electronics supplier should be able to obtain one directly from the maker I previously mentioned—Western Design Center, in Mesa, AZ. The W65SC802 could easily cost $100; a 65C02 will cost closer to $10.

As for compatibility, although the W65SC802 has 16-bit registers like the 8088 chip used in the IBM PC, that most definitely does *not* make it IBM-compatible. It is also not compatible with the Z-80 chip used by CP/M-80. Think of both of these new chips as fun devices for your own programming experiments, rather than as interfaces to alien computers.

Q: I have a C-64, a 1541 disk drive, a Pro-Writer 8510 and Tymac's Connection interface. I just purchased Broderbund's Print Shop program and have been unable to get printouts that are full paper width. The graphics are too narrow as well. Any ideas?

L.B. Smithe
Quincy, IL

A: Your problem is probably in the settings of your interface, since my other equipment is identical to yours and the program worked properly here. Be sure you set your interface to its Transparent mode when using it with any program that explicitly supports your printer. Otherwise, both your program and your interface will be attempting to make the needed translations to use your printer with your 64, creating some strange results.

If you don't want to change switch settings, set your interface to make the printer emulate a Commodore 1525 printer, and from then on choose the 1525 printer option in all programs, rather than Pro-Writer options.

This same technique applies to users of all printers connected to Commodore computers by intelligent interfaces when running programs that support non-Commodore printers.

Q: Do you have to buy a monitor with the C-128, or can you hook up the computer to a regular TV; and what are the advantages of having a monitor?

Johnny (no last name given)
Sunnyside, NY

A: The C-128 includes a TV modulator, just like the 64, and works with a TV for 40-column programs. However, you can't use an ordinary TV for 80-column color displays on the C-128. For that, you'll either need an RGBI monitor, such as Commodore's promised new 1902, or any monochrome composite monitor connected via a cable Commodore will provide. You will also notice that a video monitor gives a sharper picture with purer, brighter colors than most TVs and is free from most kinds of interference.

Q: I would like to know if the 1541 disk drive works with the new C-128.

Sidney Gellvian
New York, NY

A: Yes. You can use the 1541 with the C-128 in the C-64 and the C-128 (40- and 80-column) modes. Also, you can use the 1541 to run CP/M programs in Commodore GCR format, but not as quickly as on a 1571. Only new programs designed specifically for the 1571's added storage capacity or its Kaypro-compatible CP/M disk format are likely to give trouble on a 1541.

SOFTWARE

Q: A short time ago you published a machine-code program for sorting alphabetically. It would be very much appreciated if you would give us the same kind of program for a numerical sort.

N.H. Sumner
Valley Center, CA

A: Actually, I wrote that sort five years ago, for the Commodore PET. In various editions, it has been known as Keysort, Supersort and Subsort. Most versions automatically include the ability to sort numeric arrays as easily as string arrays, and the latest experimental version supports all Commodore machines, from the first PET through the 64, though not the C-128 or Plus/4. It is still available directly from me for $35, but it's only intended for people skilled enough in Basic programming to use arrays.

Q: I love my Commodore Plus/4 and its built-in software. However,

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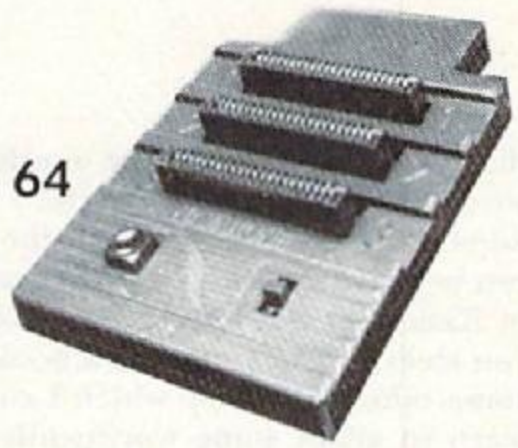

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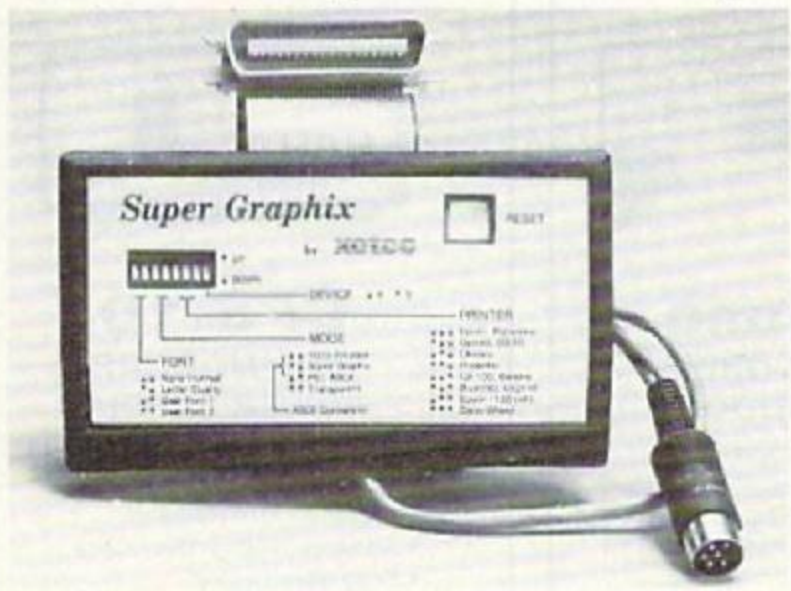

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the C-64 seems to be the machine with all the available software. I understand that programs for the 64 can be "translated" into the version of Basic that the Plus/4 uses. Could you steer this beginner to a book or some other means by which I could learn to adapt some worthwhile 64 programs to my Plus/4?

Mary Hynes
Jamaica, NY

A: So far, the only book I've noticed for the Plus/4 is *The Commodore Plus/4 Book*, from the Howard Sams Co. To order it, ask your dealer, or call 800-428-SAMS. Also, *RUN* will continue to cover the Plus/4.

Q: **I have a Commodore 64 with a cassette and an Alphacom 81 80-column printer. The main reason I bought a computer was so I could set up files for our home business, but I can't even get a letter printed, let alone customers' names and addresses. What should I do to write a letter and then be able to transfer it to my printer?**

Jeannie Reid
Yakima, WA

A: Very few small computers can do what you request when first unpacked. Except for the Plus/4, all Commodore computers need to have an additional program that you can either buy or write yourself, before you can use them to type a letter.

The solution when first starting out is to buy a program that does what you want the computer to do and load that into your computer. The kind of program you'll want for your letters is called a word processor. If you don't have a disk drive yet, I suggest you get a word processor that comes on a cartridge. These simply plug into the back of your 64 while it's turned off. Then, as soon as you turn the computer back on, you're ready to type your letter; to print it, you simply press a few keys.

Later, when you want to save letters permanently, you'd do well to get a disk drive for the purpose. That would also give you the ability to load other word processors and mail-list managers, after you've developed a need for their special features.

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Clinton Allen
Baird, TX

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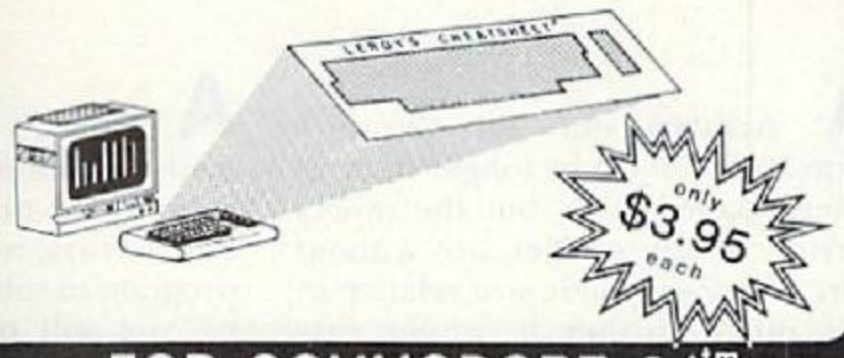

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Commodore Clinic

A: Actually, only the *first* program loaded must be longer than all others loaded later, but the others may be of any smaller size without worrying about their size relative to each other. Further, it is quite easy to fool Basic into thinking your first program is much larger than it is. A single line does it for the 64 version of my Mail Disk:

```
1060 POKE 45,0:POKE 46,64:CLR
```

This must appear right at the start of your first program, before you define any variables, because the CLR command will erase all variables. Apart from that small limitation, the only difficult part of using this trick is calculating the correct value to Poke into location 46. To obtain the correct value, store all your programs on disk, see which one occupies the most blocks and load that one into memory. Then type the following line in Immediate mode (without a line number):

```
PRINT PEEK(46)+2
```

The number that appears on your screen as a result is the one you want to Poke into location 46 in your first program.

There are other ways to chain between programs, but this method has the advantage of preserving all dynamic variables for use in programs loaded later. To be sure a string variable is dynamic, define it this way:

```
A$="LAMP ON"+""
```

The concatenation of the two strings forces Basic to make the resulting string dynamic and store it where it won't be disturbed by further program loads.

Q: **I have been requested to establish a schedule for my wife's bridge group. The group varies from 24 to 40 members; they meet once a month, eight months a year. My task is to arrive at a schedule such that no two players play with each other more than once a year. Is such a program available for my 64?**

Thomas Mason
Livermore, CA

A: Sorry, I haven't seen a bridge team selection program yet. However, if you are familiar with using Basic arrays, you can write your own program to solve this problem. To do so, you will need two arrays—one containing all possible ways to pair two of 40 players, and the other containing the actual matchings selected by the computer for each of the eight meetings. Then the computer can randomly select pairings from the first array and move them into the second array, deleting them from the first array at the same time. This automatically eliminates duplicates.

Since you can't be sure in advance who will show up, you will have to let the computer make each month's matches after members arrive that day. The computer can then omit absent members from its matchings.

Yesterday's mail brought a public domain program from Steven Darnold of Blenheim, New Zealand, that may help you get started. The program is called Team Draw, and it organizes sports tournaments, making sure all teams play each other round-robin. Though written for the C-64 and 1525, it can easily be altered for any Commodore machine and most printers. I'd be glad to send a copy for my usual $15 fee.

Q: **I am confused with the logic commands AND and OR. Whenever you encounter A = 96 AND 32, does the A equal the lower number, 32? And when A = 64 OR 32, does A equal the sum of both numbers, 96? Please help me clear up this confusion.**

Bill Goldman
Langhorne, PA

A: To understand the AND and OR commands as used in Basic computer programs, you must realize that they are written in decimal (base 10), but do their work in binary (base 2). To see their effects, you must convert the numbers they use into base 2. Casio and Radio Shack both make inexpensive calculators that do this.

Next, remember that logical commands are not arithmetic. Rather, the AND command defines a set of conditions, *all* of which must be true before the result is true. Similarly, when you're using the OR command, if *either* of two conditions is true, then the result is true.

To put these ideas together and solve one of your examples, remember that a binary 1 is considered true and a binary 0 false. Thus,

```
96 AND 32
```

is the same as:

```
    %01100000
AND %00100000
```

Notice that only one bit (binary digit) is true in both numbers. Therefore, it is the only bit true in the result:

```
%00100000
```

Converted back to decimal, your answer is 32.

The practical value is that the AND and OR commands allow you very precise control of the computer and its memory.

Q: **I like to modify programs, but some programs don't list. Every time I try to list them, they show a SYS (4036) or the word list terminates. Could you show me how to list one of these programs?**

Darren Lee
Vancouver, B.C.
Canada

A: The usual reason such programs do not list is that they were written in a language other than Basic, then assembled or compiled into unlistable machine language. Your clue to such programs is the SYS command in the one line you can list. To study such programs, you'd need to learn 6502 assembly language and then disassemble them with a machine language monitor, starting at the decimal memory address following the word SYS in the list you were able to get.

Another reason some programs don't list is because the author of the program doesn't *want* it listed and has protected it against the usual List command. For example, a teacher may not want students to be able to see the answers to a quiz program by simply listing it. As I've said before, I can't give you any help in studying such programs. R

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Graphics for the Commodore 64 Computer

Jeff Knapp
Prentice-Hall, Inc.
PO Box 819
Englewood Cliffs, NJ 07632
Softcover, 140 pp., $12.95

Graphics for the Commodore 64 Computer is a godsend for programmers who feel it's time to move beyond simple ROM-generated graphics. Author Jeff Knapp will slowly and logically lead you through the steps necessary to create advanced screen displays.

This book supplies the key to unlocking the treasures of the VIC chip, and should allow even less experienced programmers to create high-quality screen displays.

The text advances from keystroke graphics, the easiest to reproduce, to the more advanced multicolor high-resolution graphics (similar to those you might see in advanced arcade games and business programs).

Included in the book is information on how to create your own custom-character set and how to create vertical and horizontal scrolling.

Each chapter is sprinkled with examples and programs to support the text's instructions. The key to learning from this book is not only in reading it, but also in studying the program listings themselves, most of which are relatively short. (You can also purchase a disk that contains these programs.)

All of the listings are in Basic, although there is a short excursion into machine language at the point where Knapp discusses high-resolution graphics.

I found Knapp's writing style a pleasure to read. His instructions are thorough and easy to understand.

Knapp knows how to get the treasure out of the VIC Chip, as well as how to effectively share this knowledge with others. If you are familiar with the workings of the C-64 and have at least a casual knowledge of Basic, you'll be able to take Knapp's instructions and put them to work in your own programs.

The real value of this book is in the examples that it contains. Each chapter builds upon the last and prepares you for the next. Most chapters begin with Direct-mode examples, which are then developed into complete programs.

If you feel comfortable with Basic and would like to explore beyond, *Graphics for the Commodore 64 Computer* was written just for you.

Gary Fields
Asheville, NC

1541 Single Drive Floppy Disk Maintenance Manual; 1541 Maintenance Guide

Michael G. Peltier
Peltier Industries, Inc.
735 N. Doris
Wichita, KS 67212
Manual: Softcover, 190 pp., $29.95
Guide: Softcover, 64 pp., $9.95

These two books fill a huge need—the need for accessible technical information about the Commodore disk drive. These are well-prepared service manuals that can be used by electronics tinkerers and digital engineers alike.

The larger of the two, the maintenance manual, is a complete reference work, including schematics, procedures, parts lists and troubleshooting guides. This should fill the documentation needs of anyone planning to perform some serious work on the 1541.

The maintenance guide is a much-abridged version of the manual and is suitable for any 1541 owner who would like to be able to align or troubleshoot the drive. It contains little information on operating theory, nor does it provide any detailed trouble analysis.

Both books are written in the tradition of a military service manual. They include everything that the technician needs to know in order to service the equipment, including construction details for special cables. The troubleshooting sections are profusely illustrated, with step-by-step instructions for isolating problems in specific systems and subsystems.

Of greatest interest to most disk-drive owners are the instructions on speed calibration and head alignment. Peltier's method of alignment requires only a digital voltmeter and a simple home-made video detector. The alignment standard can be either an inexpensive disk (available from Peltier) or any commercially recorded disk.

These are excellent books, put together in a professional manner that should be emulated by others. Most of us should own the guide, and any-

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one with interest or training in electronics should own the manual. Both would be valuable additions to your library.

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Using & Programming the Commodore 64, Including Ready-to-Run Programs

John Herriott
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Using & Programming the Commodore 64, Including Ready-to-Run Programs is a short book with a long title that will do for new C-64 owners what aspirin does for a headache. When author John Herriott wrote this book, he kept the novice's needs in mind, as it is both easy to read and understand.

This book should remove the fear of computers from even the least experienced user. Although not a complete guide to the power of the C-64, it presents information that should fill some of the gaps left by the *Commodore 64 User's Guide*, and will prepare you for the challenge of the *Commodore 64 Programmer's Reference Guide*.

Herriott assumes that the reader is a new computer owner and begins by explaining the components of the computer and how to set up your system. Then he discusses the keyboard, special keys and how to get in and out of Direct mode.

The book's program listings do not contain Commodore graphics symbols, which is a definite advantage. Instead, the listings use CHR$ commands, which cannot be confused with anything else. This makes debugging a listing much easier to accomplish.

Each chapter is self-complete and ends with a capsule review. I found these summaries to be very helpful when I was looking for information to restudy.

Most of the subjects that new owners will need to know about are covered or at least touched upon in the book, such as sound, sprites, printer controls, using the disk drive, joystick controls and the VIC Modem.

Appendix C includes conversion commands that translate other versions of Basic to Commodore Basic. For example, you may be able to convert a listing from Apple to Commodore Basic by using the information found here.

Appendix E is a glossary of error messages that defines each one and gives probable causes and solutions.

Herriott includes two very useful listings—a small database and a word processing program. These offer the new C-64 owner some workable software for simply the cost of the book.

Using & Programming the Commodore 64, Including Ready-to-Run Programs is an outstanding value. It is among the least expensive of computer books available, and I'd recommend it for anyone who is new to Commodore computing.

Gary Fields
Asheville, NC

New Releases

Einstein's Beginners' Guide to the Commodore 64

Jeff Einstein (Harcourt Brace Jovanovich, 1250 Sixth Ave., San Diego, CA 92101. Softcover, 184 pp., $7.95.) This introductory guide discusses many of the C-64's general features, including start-up, understanding memory, file management, graphics and sound.

Computer Workout

Jim Keogh and Software Lab East (Hayden Book Co., 10 Mulholland Drive, Hasbrouck Heights, NJ 07604. Softcover, 64 pp., $2.95.) Written for ages seven and older, this book introduces children to technical terms and basic computer operations, through the use of crossword puzzles and word-search games.

Commodore 16 User's Manual

(Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, IN 46268. Softcover, 224 pp., $12.95.) Familiarizes new and intermediate users with the fundamental structure of a program and introduces the C-16's Basic 3.5 as an aid in producing simple graphics, creating music and working with numbers.

Learning Commodore 64 Basic

David A. Lien (CompuSoft Publishing, 535 Broadway, El Cajon, CA 92021. Softcover, 346 pp., $14.95.) A step-by-step guide to programming the C-64. This book provides hands-on experience, with samples and exercises to perform. A summary is provided at the end of each chapter.

Commodore 64 Micro Mansion: Using Your Computer to Have a Safer, More Convenient Home

David Bonynge (TAB Books, Inc., Blue Ridge Summit, PA 17214. Softcover, 192 pp., $11.45.) An introduction to using the C-64 as a home-control device. Discussions include how to control such activities as air conditioning, burglar and fire alarms, and appliances.

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Compiled by SUSAN TANONA

Reset Master

A Handy Peripheral That's a Sure Cure For Computer Lockup

It has happened to all of us at one time or another. You're trying to debug a program when, suddenly, the keyboard locks up. Pressing the run/stop and restore keys has no effect. At this point, a reset switch that would unlock the keyboard and retrieve the program would certainly come in handy.

You could build your own reset switch by soldering a rat's nest of wires and hardware to your computer. But such projects are notorious for causing the ROM and RAM components in the computer to gradually melt down.

There are a few reset switches commercially available that you can use with Commodore computers, but you probably won't find one more simple in design and function than the Reset Master.

Reset Master consists of a small, blue plastic box with a spring-loaded button on top. A two-foot serial cable, with a standard six-pin connector, is permanently connected to one side of the switch, and two serial ports are on the front of the switch. Fortunately, you don't have to solder or open the computer to install the unit.

Documentation is made up of a four-page manual and four short Basic Renew programs. These programs consist of four separate listings: one for the C-64 and SX-64; one for the unexpanded VIC; one for the 3K expanded VIC; and another for a VIC with 8K or more expansion.

After you've loaded and run the Renew program, pressing the reset switch will cause the computer to emulate a cold start, complete with the introductory screen. Then, if you enter the SYS command that appeared when the Renew program was executed, any program that resided in memory when the reset switch was pressed will be retrieved.

The two user ports on the reset switch give you a lot of options if you have more than one printer. The manual states that you can connect two printers to the reset switch, but a little experimentation will reveal that you can actually connect two serial printers or one parallel and one serial printer.

The manual gives three examples of wiring configurations for connecting the reset switch between peripherals, or between the computer and peripherals. All these configurations, as well as variations upon these configurations, work; but be forewarned that some of the latest serial hardware may not work properly with certain cable arrangements. I encountered a problem connecting the switch between an Indus GT disk drive and a Star SG-10C serial printer. However, none of the components involved were any worse for wear, and I seriously doubt that any other cable configuration would duplicate the problem.

You may be wondering how this device could work on an early model VIC and a late model C-64, as well as on every model of the VIC and C-64 in between. A rudimentary, but effective, countermeasure was taken by the manufacturer to ensure that Reset Master would be compatible with all VICs and C-64s. The company simply installed two small Phillips-head screws on one side of the switch's casing. Beneath one of the screws is a staple that you can easily adjust, should the switch not work with your computer. The entire procedure is clearly described, with accompanying illustrations, in the user's manual.

What you may find to be one of the most useful features of Reset Master is the two extra feet of serial cable that it provides. Overall, the ease of installation and use of Reset Master make it one of the best hardware investments available for your computer. *(Master Software, 6 Hillery Court, Randallstown, MD 21133. C-64, VIC-20/ $24.95.)*

Tim Walsh
***RUN* staff**

G-Wiz

A Full-Featured and Versatile Printer Interface For Your Commodore 64

Cardco, one of the key manufacturers of peripherals for the Commodore 64, and the maker of the +G printer interface, has introduced the G-Wiz, an expanded-function printer interface for the C-64. The G-Wiz offers all the features and functions of Cardco's +G interface, plus some additional features.

The G-Wiz has one set of eight DIP switches to control the interface functions. These switches are accessible from outside the circuit case, so you'll no longer have to take the case apart to make changes to the interface setup. (This was a prime annoyance with previous Cardco units.)

Features of the G-Wiz include: alphanumeric and full Commodore

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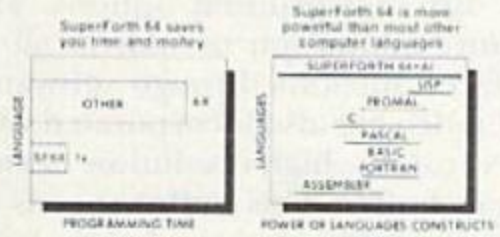

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Hardware Gallery

graphics printing; a Transparent mode, which sends characters directly to the printer; a Lock mode, which prevents a program's secondary address commands from making unwanted changes to the interface setup; and a Hexadecimal mode, which prints all characters as their hexadecimal equivalents. This is useful in program debugging.

The DIP switch settings on the G-Wiz can be read and changed with software commands. This allows you to monitor the setup of the interface in a program and alter the settings for different printout options. This feature allows you to address all interface functions through software.

Cardco has also incorporated what they call a high-resolution screen dump buffer. This buffer speeds up hi-res graphics screen dumps by as much as 18 times.

The G-Wiz also includes two character sets, so you can adjust the size of graphics characters.

My review copy of the G-Wiz interface was a beta test unit that came without a plastic case over the circuit board and without the finished user's manual. My instructions consisted of a +G manual and a 12-page insert that described the differences between the +G and the G-Wiz. Therefore, I really can't make a complete assessment of the package's documentation. However, if Cardco's documentation for its other products is any indication, I'm sure the manual for the G-Wiz will be excellent and well above the industry norm.

And now, for the best news: The G-Wiz costs about one-third less than the +G. And, if you own one of Cardco's other interfaces and are interested in upgrading to the G-Wiz, Cardco is offering a trade-in deal: In exchange for a +G, you can buy a G-Wiz for $35; and in exchange for an A or B interface, you can have the G-Wiz for $40.

The Cardco G-Wiz parallel printer interface is one of the best and, feature for feature, least expensive printer interfaces available today. *(Cardco, 300 S. Topeka, Wichita, KS 67202. C-64/$69.95.)*

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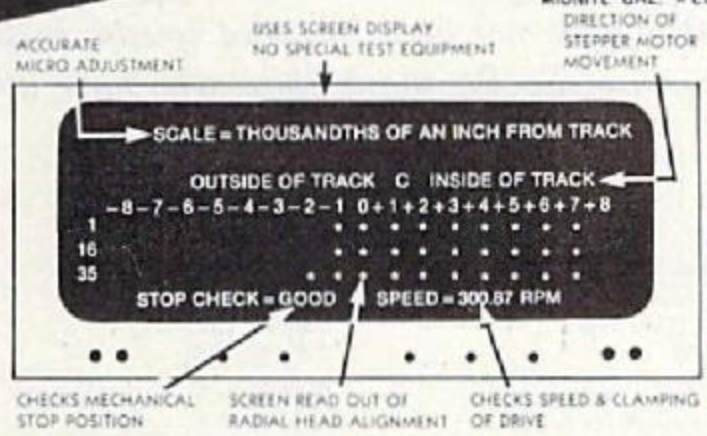
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Commodore Service Network Updates

The following update list of Commodore service centers includes two categories: 1) corrections to the list published in the July, August and September issues, and, 2) centers that have been authorized by Commodore since our original list was printed. RUN *will continue to update the list periodically, but cannot undertake to identify former centers that are either out of business or no longer affiliated with Commodore.*

We again urge authorized service centers to notify us if they have not been included (please enclose a copy of the authorization letter) or if our listing is seen to be in error. We thank those who have already done so.

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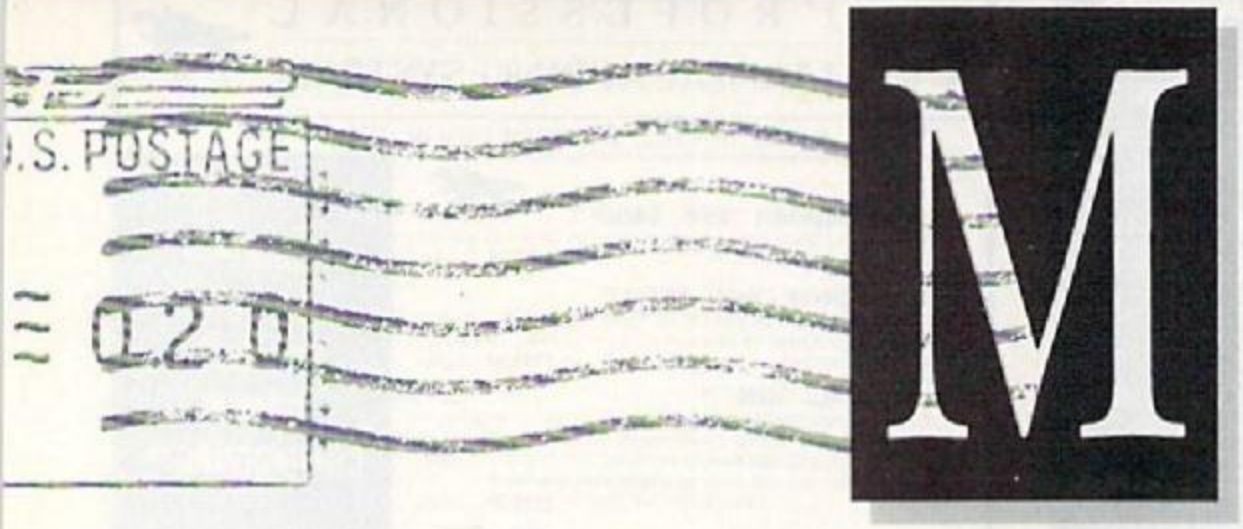

Ham Software Update

I was very pleased to see The Contester mentioned in your New Products RUNdown in the September issue of *RUN*. For small software houses like Winner's Edge, this sort of attention is very important.

Unfortunately, I felt that in the necessary cutting of our press release to fit your space requirements, two key points were missed.

First, logging and duplicate contact checking are fully integrated with automatic transmission of Morse code, including all of the most-needed contest transmissions.

This leads directly to the second key point and the real strength of the package. Unlike anything before it, The Contester is designed for practical real-time use during amateur radio contests. Every function has been optimized from the standpoint of the contest operator. I have been a contester for over a decade, and the program incorporates everything I have learned during that time.

Peter G. Smith, N4ZR
President, Winner's Edge Software
Reston, VA

Basic 4.5 Enhancement

Many thanks to *RUN* magazine and Robert Rockefeller of Ontario for the absolutely terrific series on Basic 4.5 (June, July, August 1985 issues). I typed everything in, and it worked great! The added disk commands are as handy as just about anything going, as long as you can live with the slight shortage of RAM for your program.

I would like to offer one enhancement for users of Basic 4.5. After typing and running all of the loader programs that you want to include in your own version of Basic 4.5, type in the following commands in the Immediate mode.

```
POKE 43,0: POKE 44,128: POKE 45,1: POKE
46,160:SAVE"4.5 BASIC ML",8 {RETURN}
```

After the disk drive settles down, you will have on the disk a complete copy of Basic 4.5 in machine language format. Then, when you want to install it, just type:

```
LOAD"4.5 BASIC ML",8,1 {RETURN}
```

and then

```
SYS 64738 {RETURN}
```

and the 4.5 screen will appear with all of the commands available! Using this technique precludes the need to load and run all of the individual loader programs every time you want 4.5 installed.

Donald Graham
Baltimore, MD

A Time-Saving Disk Utility

In regard to Robin Franzel's article, "The Key to Your Disk Directory" (August 1985)—fantastic!

This is what I've been looking for! I've been using Mike Konshak's Datafile programs (*RUN*, November and December 1984) and found that I was wasting a lot of time returning to the main program just to use the @ command to call up the directory. Franzel's program eliminates all that.

I looked up Robin Franzel's screen dump utility ("Print Your Screen") in *RUN*'s December 1984 issue. Again, fantastic! It works beautifully with Datafile.

Anna I. Jackson
Paducah, KY

Monitor for the C-128

In your initial review of the C-128 ("The C-128—A New Era of Compatibility," May 1985), the author, Guy Wright, stated that the C-128 would not work with the Commodore 1702 monitor. Which monitors (besides the one being developed by Commodore for the C-128) will work with this machine?

When Commodore was developing the C-128, why didn't they also develop an adapter so the C-128 could be used with the 1702? It would be nice to have a C-128, but on my budget and considering that I don't need many of the new capabilities, I'll just stick with the C-64.

Ralph G. Close, Jr.
Ridgecrest, CA

First of all, you can use the 1702 monitor with the C-128, and you can use it as is—you don't need an adapter. To use the monitor in 80-column mode, you need only connect a cable, which you can make or buy, to the RGBI port (see Margaret Morabito's article, "C-128 Monitors," RUN, October 1985). A few third-party

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manufacturers (Cardco, for instance) are coming out with such cables.

As for other monitors that you can use with the C-128, there are several. You can use any third-party monochrome monitor, such as Zenith or Taxan. These monitors will work in both 40- and 80-column modes. Also, any RGBI color monitor will work with the C-128. The Sears RGBI monitor/color TV will give you a full range of color in both 40- and 80-column modes.

Editors

No More Mistakes

Thank you for your checksum program, Perfect Typist, which you published in your September 1985 issue. In the previous 15 months that I've had *RUN*, I would always make a mistake when typing in a program's Data statements. This month, I've typed all of the programs and not one of them has a mistake in it.

With the checksum, I can type programs ten times faster and more accurately.

Michael Traina
Carteret, NJ

Assembly Language Made Easy

I am a very amateur computer buff, who has been trying to understand machine language for some time. Most articles and books have been a disappointment. At the outset, I would feel I knew what was going on; then, all of a sudden, I would be completely lost. They seemed to jump from the obvious to the esoteric.

Your series on assembly language over the last few months has been great! I now have Mr. Sanders' assembler program on tape, and the light begins to dawn. I even find that other previously published articles on assembly language begin to make more sense.

Jean P. Nance
St. Joesph, IL

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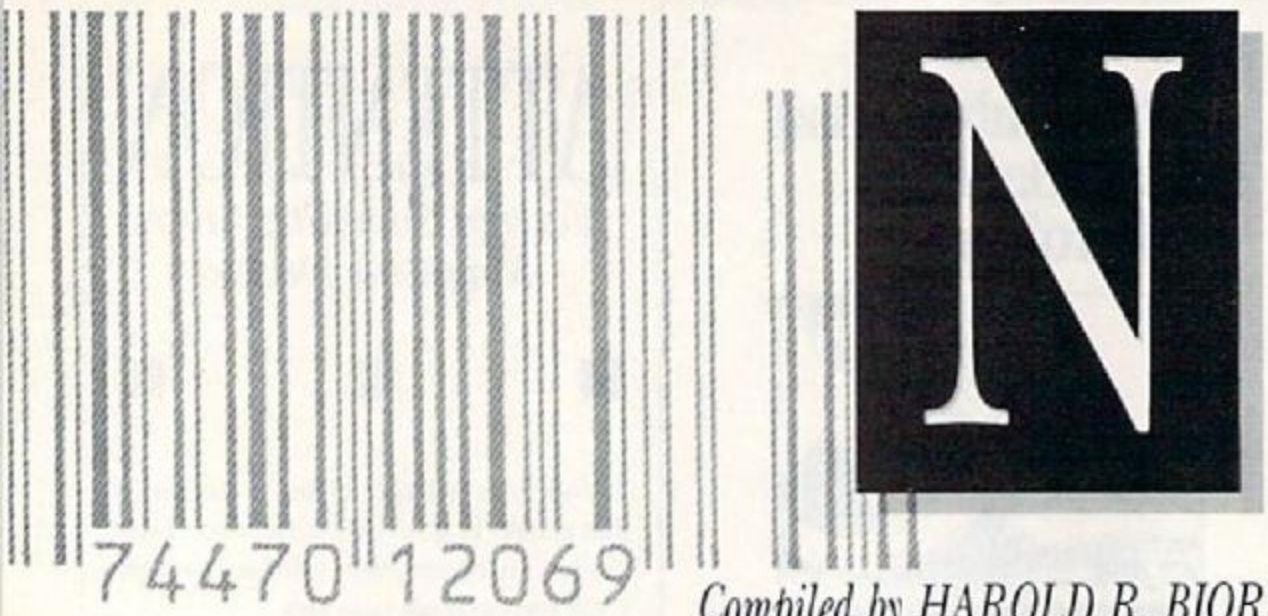

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Check Reader Service number 414.

Overnight Sensation

Learning Guitar Overnight, a tutorial music program for the C-64, teaches basic chord recognition. Strum-along sound effects allow you to recognize and play simple songs immediately. Learning Guitar Overnight is available on disk for $39.95 from Chipware, PO Box 110, Chester, NH 03036.

Check Reader Service number 416.

For Little Game Makers

Mr. Pixel's Game Maker, a game-generator program, lets children create their own computer games while learning to program.

Children aged eight and older can play several example games included on the disk, write simple programs that change the actions of characters or use conditional (If...Then) statements to change or establish game rules.

The package can be used in conjunction with Mr. Pixel's Programming Paint Set and Mr. Pixel's Cartoon Kit. It's available for the C-64 for $29.95. Mindscape, Inc., 3444 Dundee Road, Northbrook, IL 60062.

Check Reader Service number 408.

Printmaster/S

Omnitronix (PO Box 43, Mercer Island, WA 98040) has released Printmaster/S, an RS-232 printer interface that plugs into the Commodore serial bus and provides complete RS-232 signals for use with any RS-232 printer. It also supports all Commodore graphics and graphics characters.

The Printmaster/S is switch-selectable for 300, 600, 1200 and 2400 baud, plus parity, word and stop bits. Available for $119.95.

Check Reader Service number 415.

Peace of Mind

Spectrum 1 Network (9161 Beachy Ave., Arleta, CA 91331) has released Peace of Mind, the first in its Down to Earth software series for the C-64.

The package includes four separate programs. Home Inventory allows you to input important information on up to 200 personal belongings. Credit Card Guardian holds complete data on up to 60 credit cards. Private Messages allows you to store up to 100 lines of messages or other text, and Vital Statistics provides up to 50 pages of important facts about bank accounts, insurance, investments and important names and addresses.

Peace of Mind is available on disk for $19.95.

Check Reader Service number 409.

C-128/80

Cardco (300 S. Topeka, Wichita, KS 67202) has released C-128/80, a five-foot video adapter cable that enables the C-128 to output 80-column monochrome displays to any standard composite video monitor. The cable connects to the computer's RGBI port and the monitor's video input jack. Available for $9.95.

Check Reader Service number 410.

Colonial Conquest

Colonial Conquest is a joystick-controlled strategy game. In the struggle for world dominance, each player controls one of six countries and orders troops and fleets to attack any number of 131 territories. The game is available on disk for the C-64 at $39.95 from Strategic Simulations, Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043.

Check Reader Service number 411.

Three from RAK

RAK Electronics (PO Box 1585, Orange Park, FL 32067) has released three programs for the C-64.

Games Disk includes five games: blackjack, Poker-64, craps, slots and Star Trek.

Utilities Disk includes six programs: C-64 Type-Right, a word processor; C-64 Typing Tutor; Finance; Super Budget; Super Checkbook and Sales/Expense.

Ham Radio Disk comes with 12 amateur radio applications programs, including Ham Antennas, Morse

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Check Reader Service number 405.

New Peek A Byte Version

Peek A Byte 64, Version 2.0, with the Disk Mechanic, is a new version of the disk and memory utility for the C-64 and 1541 disk drive.

The new program features a track/sector editor that reads and writes all disk tracks, including half tracks. In addition, the Disk Mechanic can copy track formats from one disk track to another, and can erase the format either completely or on a range of tracks.

Peek A Byte comes with the DOS Wedge 5.1 for simplified DOS commands and can be used with a machine language monitor program without losing disk data stored by Peek A Byte. Available for $35 from Quantum Software, PO Box 12716, Lake Park, FL 33403.

Check Reader Service number 406.

Dr. Seuss Puzzler

Dr. Seuss Fix-up the Mix-up Puzzler is an electronic jigsaw puzzle for children featuring six storybook characters. Each puzzle is randomly designed by the computer, allowing for different combinations and five skill levels to choose from. When the puzzle is completed correctly, the Dr. Seuss characters come to life through on-screen animation. Available on disk for the C-64 at $29.95 from CBS Software, One Fawcett Place, Greenwich, CT 06836.

Check Reader Service number 407.

1541 Disk Manager

Tidal Bore Software (230 Pleasant St., Truro, Nova Scotia, Canada B2N 3S8) has released the 1541 Disk Manager, a menu-driven program for the C-64.

The program keeps your disks organized, sends most disk commands, copies files, backs up disks, performs multiple file-scratching and displays the load addresses of hidden machine language files.

The 1541 Disk Manager is available for $12.

Check Reader Service number 400.

Mercury Modem

Mercury, a 300-/1200-baud modem from Computer Friends (6415 S.W. Canyon Court, Suite 10, Portland, OR 97221) supports all popular communications software packages and features front-panel display lights. The modem costs $265 and includes power supply, manual and telephone cable.

Check Reader Service number 412.

Casio CZ Patch Librarian

The Casio CZ Patch Librarian is a program for the C-64 that lets you see all the parameters available on the Casio synthesizer, and each parameter can be altered and immediately auditioned. Groups of 16 patches can be sent to and received from the Casio. You can then alter, delete, rearrange or store the group. Approximately 1000 patches can be stored on one disk.

The package is available for $65 from Dr. T Music Software, 66 Louise Road, Chestnut Hill, MA 02167.

Check Reader Service number 401.

And They're Off!

F&S Software (PO Box 570069, Miami, FL 33257) has released Speedalyzer, a thoroughbred horse-race handicapping program for the C-64. The program uses information taken from the *Daily Racing Form* to analyze races.

Speedalyzer is available on tape and disk for $25.

Check Reader Service number 403.

International Hockey

Artworx (150 North Main St., Fairport, NY 14450) has released International Hockey, a game for the C-64, which provides the same play action as its predecessor, Slapshot Hockey, including speech synthesis and two-player action.

You can also play against the computer in three difficulty levels. Available on disk for $24.95.

Check Reader Service number 404.

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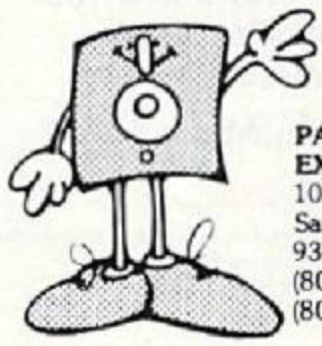

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Check Reader Service number 421.

Music Connection

Q-R-S Music Rolls (1026 Niagara St., Buffalo, NY 14213) introduces MIDI Magic, a musical instrument digital interface that allows you to connect your C-64 to many electronic musical instruments.

MIDI Magic plugs directly into the user port of the computer and the MIDI In socket on the instrument. The package includes a six-song demo disk and retails for $49.95.

Check Reader Service number 416.

We'll Back You Up

Micro-W (1342B, Route 23, Butler, NJ 07405) has released a new version of its Clone Machine, a utility and backup program for the C-64 and 1541 disk drive. With it, you can back up all file types, including relative files, and can edit tracks and blocks in hex or ASCII. In addition, an enhanced backup file automatically finds and replaces all errors.

Clone Machine's Tough-Nut utility features the ability to duplicate non-standard sectors, detect and reproduce software containing density/frequency alterations, alter the number of sectors on a track and reformat a single track. This new version of Clone Machine is available for $49.95.

Check Reader Service number 420.

Principles of Composition

Art Instruction Software (PO Box 1352, Patchogue, NY 11772) introduces Principles of Composition, a tutorial that teaches art. With it, you can learn about color, texture, composition, design, shapes and patterns. Features include ease of use, many graphics, a design test and immediate criticism, which shows you what makes for good and poor design.

Principles of Composition is available on two disks for the C-64 for $149.

Check Reader Service number 402.

For Helicopter Pilots

Gunship—The Helicopter Simulator, from MicroProse (120 Lakefront Drive, Hunt Valley, MD 21030), is a new action game for the C-64.

Gunship simulates the AH-64 Apache attack helicopter and features multiple weapon and navigation systems, joystick flying system and 3-D graphics that allow you to maneuver between buildings and ground obstacles with the effect of high-speed flight.

Gunship—The Helicopter Simulator is available on disk for $34.95.

Check Reader Service number 417.

The Whole Bit

Applied Technologies (Lyndon Way, Kittery, ME 03904) has released Version 2.1 of The Whole Bit, its word processing program for the C-64.

Among the many features of this program are: menu selection of printers; the ability to custom-tailor your own print commands for other printers; a Printer Customize routine that allows any or all of the numerous embedded Print commands to be redefined and saved as a file on any one or all of your text-file disks; an extensive on-line Help function; global search and replace; and header, footer and page numbering. Available on disk for $39.95.

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Check Reader Service number 419.

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How to Type in C-64 Listings from *RUN*

Type in 64 Perfect Typist (see Listing 1) and save it to either tape or disk before running it. If you make a mistake entering the Data statements, a message will be printed on your screen. Correct any errors and save the new version.

When you want to type in a C-64 program from *RUN*, first load and run 64 Perfect Typist. Two SYS numbers will be displayed on your screen. Jot these down and keep them handy. They are the SYS numbers for deactivating the checksum and reactivating it.

You might want to deactivate the checksum in the middle of your program entry for some reason. The only way to accomplish this, besides turning off the power, is to type SYS 40794 and press the return key.

After 64 Perfect Typist has been loaded and run, start typing in your program lines just as you normally do. The only difference is that after you have pressed the return key to log in your line, a one-, two- or three-digit number will appear below the line on the left-hand margin. This number, the checksum, will be from 0 to 255.

If the number matches the checksum value given in the program listing, the line is correct, and you can type the next line right over the previous line's checksum value. If the checksum values are different, look through the line for typing or spelling errors. Make any needed changes and hit the return key again. Continue until the program is finished.

When you have entered your program, disable 64 Perfect Typist (by typing the SYS disable number that is shown on the start-up screen), and then save the program as usual. If you run the program and get an Out-of-Memory error, turn the computer off and back on. This will clear 64 Perfect Typist out of memory.

You may save part of a program at any time and continue later. If you've already turned your computer off, you'll have to reload and rerun 64 Perfect Typist, then reload the program you were working on, list it and continue where you left off.

How to Type non-C-64 Listings from *RUN*

For listings other than C-64, we have translated everything we thought might be confusing in any program. When you see something between the curly brackets, all you have to do is press the keys indicated. For example:

{SHIFT L}—means hold down the shift key and press the L key.
{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key.
{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.
{HOME}—press the CLR/HOME key without shifting.
{CTRL 6}—hold down the control key and press the 6 key.
{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).
{CRSR UP}{CRSR DN}{CRSR LF}{CRSR RT}—these are the four cursor directions.
{UP ARROW}—means the arrow key (the one with the pi sign under it).
{LB.}—the British pound sign (£).
{PI}—the pi sign key (π); (shift and press the up-arrow key).

In some instances, when numerous characters or spaces are repeated, we will represent them this way: {22 spaces} or {17 CRSR LFs}.

Listing 1. *64 Perfect Typist program.*

```
10 POKE56,PEEK(56)-1:POKE52,PEEK(56):CLR
20 PG=PEEK(56):ML=PG*256+60
30 FORX=MLTOML+154:READD:T=T+D:POKEX,D:NEXT
40 IFT<>16251 THENPRINT"ERROR IN DATA...":E
   ND
60 POKEML+4,PG:POKEML+10,PG:POKEML+16,PG
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   T IS NOW ACTIVE{2 SPACEs}**"
100 PRINT"{CRSR RT}** SYS"ML"=ON{5 SPACEs}S
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101 PRINT"{CRSR RT}**********************
    **************":NEW
110 DATA 173,005,003,201,003,208,001,096
120 DATA 141,105,003,173,004,003,141,104
130 DATA 003,162,103,160,003,142,004,003
140 DATA 140,005,003,096,234,234,173,104
150 DATA 003,141,004,003,173,105,003,141
160 DATA 005,003,096,032,124,165,132,011
170 DATA 162,000,142,240,003,142,241,003
180 DATA 189,000,002,240,051,201,032,208
190 DATA 004,164,212,240,040,201,034,208
200 DATA 008,072,165,212,073,001,133,212
210 DATA 104,072,238,241,003,173,241,003
220 DATA 041,007,168,104,024,072,024,104
230 DATA 016,001,056,042,136,016,246,109
240 DATA 240,003,141,240,003,232,208,200
250 DATA 173,240,003,024,101,020,024,101
260 DATA 021,141,240,003,169,042,032,210
270 DATA 255,169,000,174,240,003,032,205
280 DATA 189,162,003,189,211,003,032,210
290 DATA 255,202,016,247,164,011,096,145
300 DATA 013,032,032
```

RUN AMOK

Item: In our checksum program, 64 Perfect Typist, an annoying graphics character appears with the checksum number on some C-64s. To eliminate this, lines 40 and 280 have been changed in Listing 1, above. You should also make the change if this character has been bugging you.

Item: A problem arises in the Key to Your Disk Directory program (August 1985, p. 70) when a file size is exactly 34 blocks. The program then becomes confused because it looks for the quote mark that precedes a filename, and CHR$(34) is a quote mark. To fix the problem, change lines 170 and 180 and add lines 560, 570 and 1065 as follows:

```
170 DATA 208,63,201,34,240,5,32,52,195,208,240,76,1554
180 DATA 218,195,8,198,199,169,122,133,251,208,213,24,1938
560 DATA 32,165,255,208,251,162,3,32,165,255,202,16
570 DATA 250,165,199,240,3,76,207,193,76,215,193
1065 FOR I=50138 TO 50160:READK:POKEI,K:NEXT
```

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December

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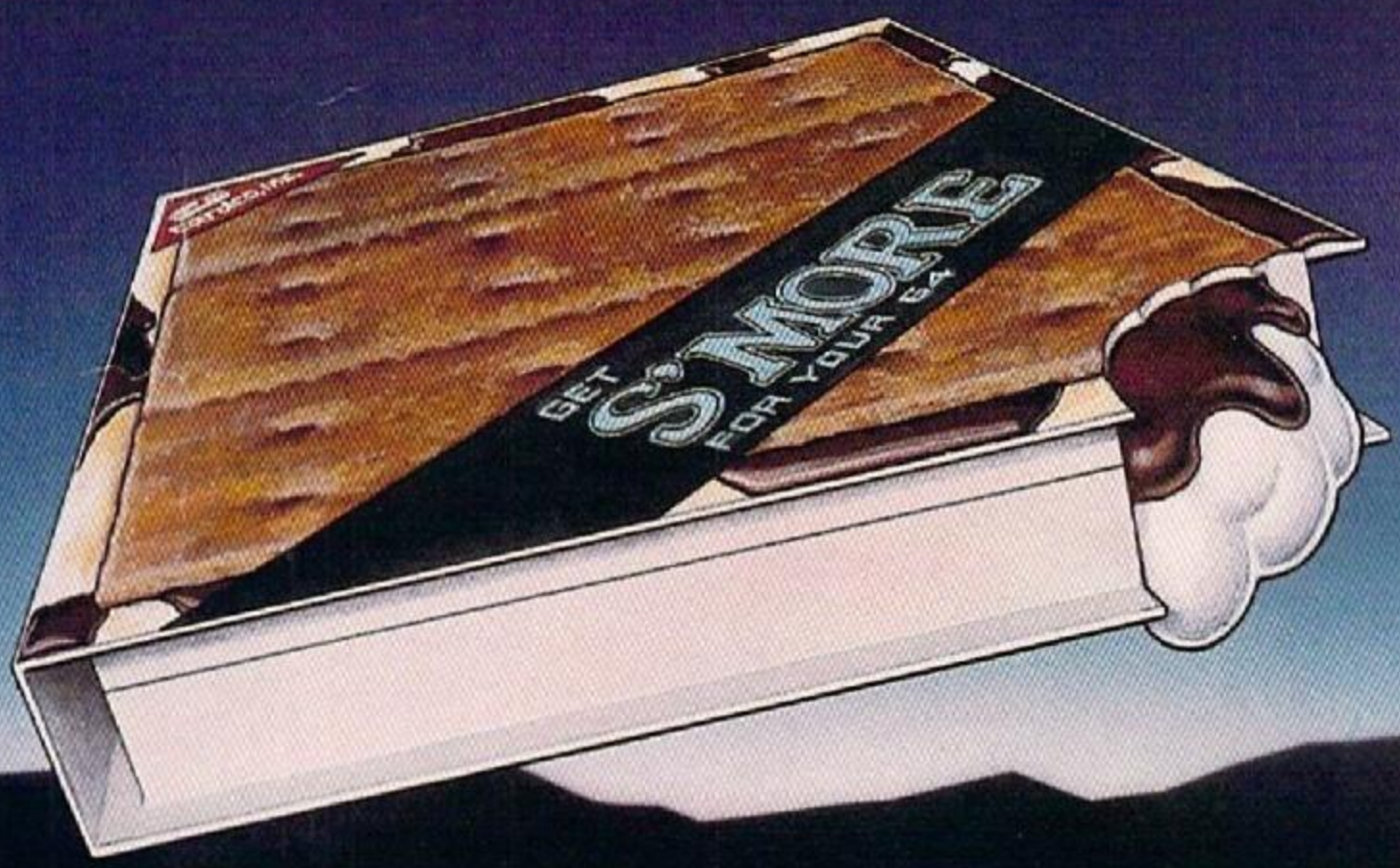

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